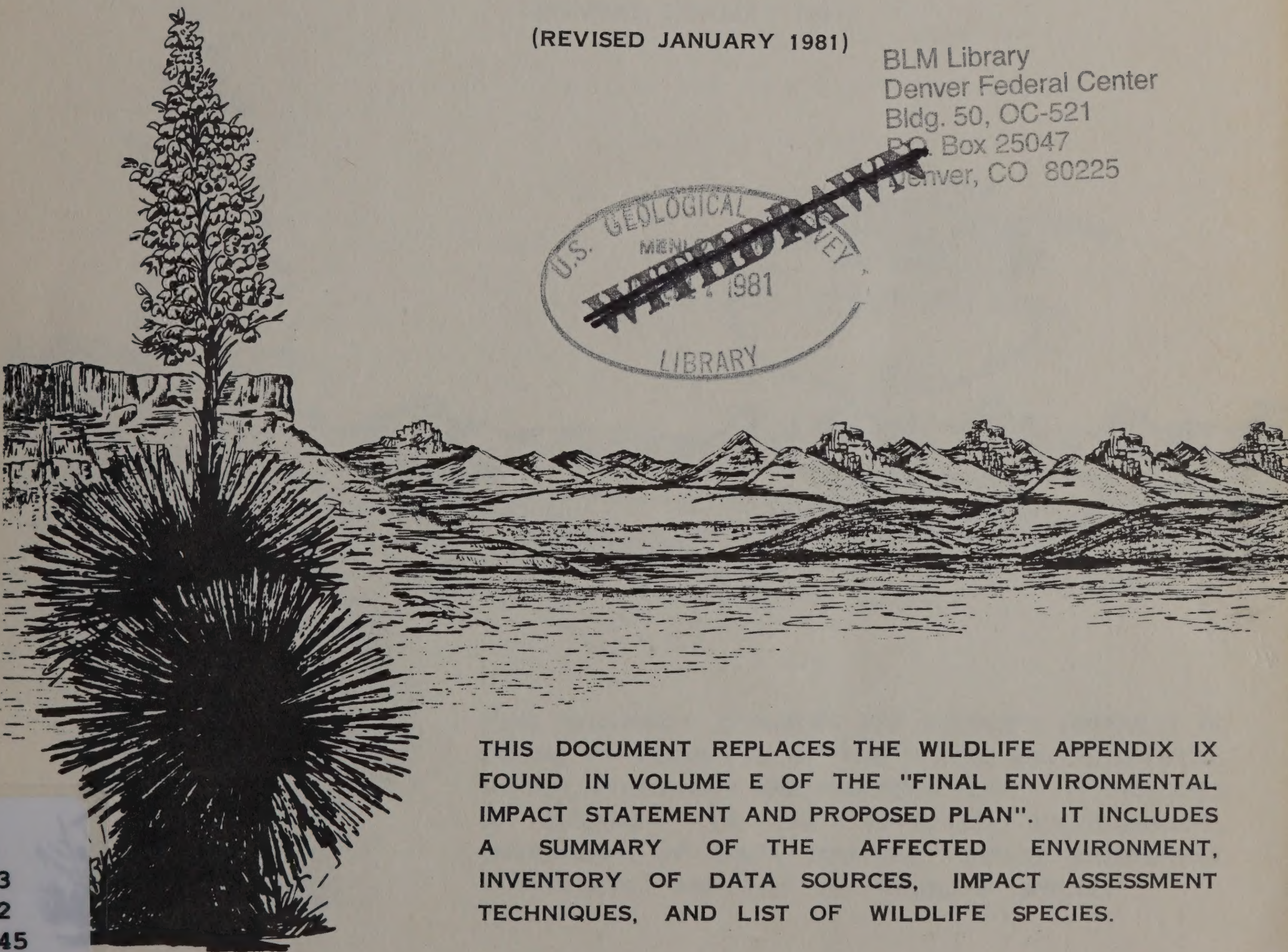
United States Department of the Interior
BUREAU OF LAND MANAGEMENT

CALIFORNIA DESERT CONSERVATION AREA

VOLUME E

APPENDIX IX
Wildlife

(REVISED JANUARY 1981)



THIS DOCUMENT REPLACES THE WILDLIFE APPENDIX IX FOUND IN VOLUME E OF THE "FINAL ENVIRONMENTAL IMPACT STATEMENT AND PROPOSED PLAN". IT INCLUDES A SUMMARY OF THE AFFECTED ENVIRONMENT, INVENTORY OF DATA SOURCES, IMPACT ASSESSMENT TECHNIQUES, AND LIST OF WILDLIFE SPECIES.

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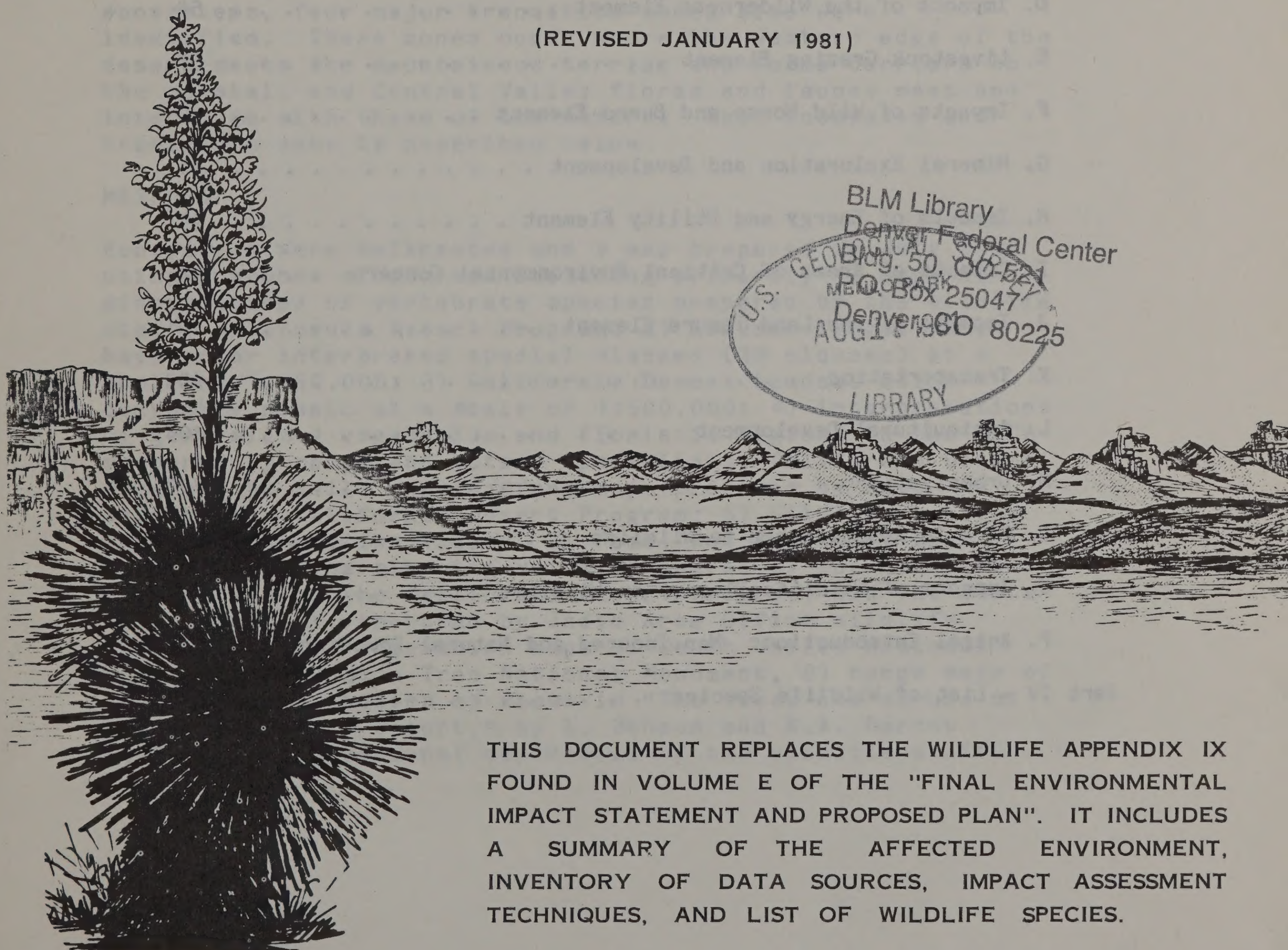

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Appendix IX
Wildlife
Part I

AFFECTED ENVIRONMENT IN THE CALIFORNIA DESERT CONSERVATION AREA

The California Desert Conservation Area is composed of portions of three major deserts - the Great Basin, Mojave, and Colorado (Sonoran) Deserts. These were briefly described in the Affected Environment, Wildlife, of the Environmental Impact Statement. For convenience of understanding the distribution of wildlife resources in the CDCA, two of the three major deserts, the Mojave and Colorado, were subdivided into ecosystems. The term "ecosystem" is used here to describe geographic regions of similar climate, elevation, topographic features, and plant and animal communities. Because the Great Basin Desert is represented by such a small portion in the northern part of the CDCA, it was not subdivided. In addition to these ecosystems, four major transition zones also were identified. These zones occur where the western edge of the desert meets the mountainous terrian and forms barriers to the coastal, and Central Valley floras and faunas meet and intergrade with those of the desert. Each ecosystem and transition zone is described below.

METHODS

Ecosystems were delineated and a map prepared in July 1980 using a number of sources including primarily 1) maps of distributions of vertebrate species prepared by the wildlife staff, California Desert Program; 2) Landsat images which have color interpreted special classes (28 classes) at a scale of 1:250,000; 3) California Desert Landsat color composite mosaic at a scale of 1:500,000; 4) interpretations of generalized vegetation and floristic regions in the CDCA prepared by range and botany specialists, California Desert Program; 5) soils and landform maps prepared by soil scientists, California Desert Program; 6) wildlife habitat maps for the Saline Valley, El Paso, Red Mountain, East Mojave, and Yuha planning units, prepared by the wildlife specialists of the California Desert Program, and the Santa Rosa Mountains, prepared by Indio Area Office wildlife specialists; 7) vegetation maps of Death Valley National Monument and Joshua Tree National Monument, 8) range maps of various plant species as shown in "The trees and shrubs of the southwestern desert," by L. Benson and R.A. Darrow (1954); and 9) personal experience of the wildlife staff.

Although not in final map form until July 1980, the ecosystem classifications were used by the wildlife staff in developing recommendations for preserving representative animal populations, portions of ecosystems, and wildlife habitats in the CDCA. Ecosystems concepts were particularly important in considering requirements of predators and species with relatively low numbers and large foraging areas.

MOJAVE DESERT ECOSYSTEMS

The Mojave Desert was subdivided into four ecosystems: 1) Northern Mojave, 2) Western Mojave, 3) Central Mojave, and 4) Eastern Mojave.

Northern Mojave Desert. Geologically, this region is part of the "Basin and Range" providence because enclosed valleys and drainages, some of which are near or below sea level, are surrounded by steep, parallel mountain ranges reaching elevations of 7,000 to 11,000 feet. Effective rainfall occurs primarily in late fall and winter. Partly because of the tremendous range in elevation and precipitation, a wide variety of wildlife habitats occurs in this ecosystem. The term "wildlife habitat" is used here to describe a region of identifiable vegetation, soil, and topography which has a well-defined vertebrate community (see Berry 1977).

This ecosystem has several types, of creosote bush scrub and alkali sink habitats at lower elevations; some of these are low in productivity of both vegetation and animals. Higher mountains have sagebrush, pinyon pine, juniper, limber pine, and bristlecone pine habitat. Examples of sensitive habitats here within this ecosystem are Panamint Valley Dunes, Eureka Valley Dunes, Darwin Falls, Panamint Lake, and Upper Amargosa River. Typical animal species include desert bighorn sheep, Golden Eagle, and Prairie Falcon.

Western Mojave Desert (Subset 1). This ecosystem is primarily a region of broad valleys and fans at elevations of 2,000 to 3,500 feet. Compared to other desert ecosystems there is little topographic relief, with only occasional low hills and mountains not exceeding 5,000 feet. Rainfall occurs primarily in winter. Most vegetation is of creosote bush scrub, Joshua tree woodland, and alkali sink types. Creosote communities in the CDCA occur in this region, and formerly there were Joshua tree woodlands and grasslands. There are few washes; most contain larger examples of shrub species found nearby (e.g., creosote bush, rabbitbrush,

cheesebush, and saltbush). Water sources are few. Typical animal species are desert tortoise, Mohave ground squirrel, antelop ground squirrel, and Merriam's kangaroo rat in the low-lands with Golden Eagles and Prairie Falcons nesting on rocky hillsides. Chukar are common in some low mountain ranges.

Western Mojave Desert (Subset 2). This ecosystem is similar to the region described above, except there is more topographic relief. The area includes numerous scattered, low, rocky mountain ranges, often with stands of Mojave yucca. Joshua tree woodland, alkali sink, and creosote-burrobush habitats are present in valleys; there are few washes. Desert tortoise occurs here as well as Golden Eagle and Prairie Falcon.

CENTRAL MOJAVE DESERT. The central portion of the Mojave Desert extends north and east from the Calico Mountains in the vicinity of Barstow to the Amargosa Gorge. This region ranges in elevation from 2,000 to 5,000 feet and is generally drier and of lower productivity than areas to the north and west. Characteristic habitats consist of creosote-burrobush scrub and alkali sink, often with windblown sand. Low, eroded mountain ranges often contain small, widely scattered clusters of Mojave yucca. Joshua trees are widely scattered throughout the region but do not form the dense stands found further to the west or east. There are bighorn sheep in a few mountain ranges, such species as desert tortoise are present, and the Mohave ground squirrel reaches the eastern extension of its range here.

EASTERN MOJAVE DESERT. This broad ecosystem extends from the Nopah Mountains and Pahrump Valley in the north to the Fenner Valley in the south. It includes several large valley systems (Mesquite, Piute, Lanfair, Ivanpah, shadow) surrounded by precipitious mountain ranges (Granite, Providence, New York, Kingston) that contain relict plant communities such as white fir forest. Creosote, Mojave yucca, and Joshua tree woodlands with grass, cactus, and numerous shrubs are present at lower elevations. Grasses, cacti, and agave are common components of the vegetation. There are washes with catclaw, black-banded rabbitbrush, and desert almond. Mountain habitats typically have pinyon-juniper woodland. Elevations range from 3,000 to 7,000 feet. Over 200 water sources occur in the numerous mountain ranges.

The eastern Mojave has high wildlife diversity (e.g., the second highest concentration of desert bighorn sheep as well

as a major desert tortoise population in Ivanpah Valley).

COLORADO DESERT ECOSYSTEM

Coachella Valley. This large valley, located east of the Santa Rosa and San Jacinto Mountains and southwest of the Little San Bernardino Mountains, is comprised of extensive aeolian sand sheets, low stabilized dune systems, and eroded hills of crumbling conglomerate rock. Elevation ranges from 232 feet below sea level along the northern shore of the Salton Sea to 1,500 feet in the Mecca Hills. The northern and eastern edges of the valley contain large alluvial fans formed from erosion of surrounding mountains; these fans consist of a coarse gravel substrate broken by carrow, sandy wash systems. Vegetation is varied, ranging from ocotillo-agave-cholla scudded lower slopes of the Peninsular Range to the creosote-burrobush dominated valley floor. Mesquite hummocks are presented on stabilized dune systems. Springs and subsurface water sources located along the southern edge of the Mecca Hills support scattered groves of native Washington fan palms.

There are some important species such as the Coachella Valley fringe-toed lizard, desert pupfish, California Black Rail, and Coachella round-tailed ground squirrel.

Northern-Central Colorado Desert. This ecosystem extends from the southeastern base of the Newberrry Mountains in the west to the Colorado River in the southeast. Topography is characterized by broad desert basins and valleys surrounded by rocky mountains and low hills. Numerous playas extend from Soda Lake southeast into Cadiz and Rice Valleys. Extensive aeolian sand sheets and dune systems connect these playas. Vegetation in mountains consists of creosote bush and burrobush, interspersed with Mojave yucca, cholla, catclaw, and other shrubs. Low, widely scattered creosote bushes occur in valley systems. Playas and large dune systems support only peripheral vegetation. Low annual precipitation, absence of permanent water sources, and generally low productivity characterize this area. Elevatiŏn ranges from 1,000 to 4,100 feet. There are small bighorn herds in a few of the mountain ranges.

Northeastern Colorado Desert. This large region contains broad valleys dominated by ocotillo-creosote bush-burrobush habitats with Krameria and scattered teddy bear cholla. There are large washes with palo verde, smoke tree, and ironwood, as well as catclaw and mesquite. Most lower mountains are sparsely vegetated with creosote bush; however, the Old Woman Mountains are more typical of the

eastern Mojave and contain pinyons and junipers and several permanent water sources. Rainfall comes in both summer and winter. Elevation ranges from 1,000 feet along the Colorado River and 1,500 feet in the valleys to about 3,000 to 4,000 feet in most mountains. Valleys once supported pronghorn, and some have relatively high tortoise densities. There are desert bighorn sheep in most of the mountain ranges. Desert washes contain ich bird communities at relatively high densities.

Southern Colorado Desert. This ecosystem extends from the southeastern edge of the Little San Bernardino Mountains, south and east to the Colorado River. It is characterized by broad valley systems and drainages interspersed with low, rocky mountains. Large drainages consist of extensive washes fed by numerous smaller arroyos which are formed from seasonal runoff from adjacent hills. Vegetation along wash systems is often much more diverse than surrounding bajadas and plains which contain desert pavement, creosote bush, brittle bush, ocotillo, and teddy bear cholla. Washes contain smoke tree, mesquite, ironwood, palo verde, catclaw, wolfberry, and many other desert shrubs. Mountain ranges along the eastern half are often lower and drier and have much lower floral density and diversity than mountain ranges located further west. Elevation ranges from 300 feet along the Colorado River to 4,800 feet in the Hexie and Little San Bernardino Mountains. This ecosystem has desert bighorn sheep, mule deer, Prairie Falcon, Gambel's Quail, White-winged Dove, desert tortoise, and Couch's spadefoot toad.

West Mesa. On the West Mesa, sandy plains, desert pavements, and washes are interspersed with low, rocky hills and eroded mountain ranges. Elevation ranges from -232 feet along the southern Salton Sea shoreline to 1,000 feet on the eastern slope of the Peninsular Range. Vegetation is varied and consists of low, widely spaced creosote bushes and saltbushes. There are mesquite hummocks with windblown sand and octillo-creosote communities with desert pavement. There are a few smoke tree washes. Diverse Mojave yucca-ocotillo-barrel cactus-creosote bush communities occur along lower mountain slopes in the southwest corner. Permanent sources of fresh water are available at Harper's Well, in San Felipe Creek, and in a few palm groves in the southwestern mountain slopes.

Species typical of the low valley are desert iguana, desert kangaroo rat, round-tailed ground squirrel, Colorado fringe-toed lizard, flat-tailed horned Lizard, Costa's hummingbird, Verdin, and Black-tailed gnatcatcher.

East Mesa. This area is composed of extensive sand sheets and pavement in the west with the Algodones Dunes or Imperial Sand Hills in the east. Elevations range from 150 feet along the Mexican border to 500 feet on the southwestern edge of the Chocolate Mountains. Annual precipitation is low; there are few sources of surface moisture available for wildlife for long periods of time. Vegetation on the western portion is dominated by creosote bush scrub or mesquite hummocks; smoke tree, palo verde, and mesquite are present along wash borders and in pockets along the eastern edges of dune systems. The dunes have scattered creosote bushes and other low shrubs and grasses, including several rare plant species.

Some typical animal species are desert kangaroo rat, Colorado fringe-toed lizard, desert iguana, and the flat-tailed horned lizard.

TRANSITION ZONES

Desert Slopes - Inyo Mountains. The east face of the Inyo Mountains is steep and precipitous with slopes rising to elevations of 1,500 to 2,500 feet at the floor of Saline Valley and to almost 8,000 feet at the crest of the Inyo Mountains. The slopes include a number of desert and montane habitat types and ecotones, ranging from sparsely scattered creosote bush and saltbush scrub to bristlecone and limber pine forests. Canyons containing riparian vegetation dissect these desert slopes. Lower elevation canyons support plant communities containing creosote bush, winter fat, willow, and columbine. Higher elevation canyons contain cottonwoods, willows, grape, wild rose, sedges, and cattails. There is an abundance of surface water in many of the canyons.

Some of the more typical wildlife species found in this area include sagebrush lizards, Mountain Quail, Pinyon Jays, Panamint chipmunks, mule deer, Inyo Mountains salamander, and Panamint alligator lizard.

Desert Slopes - Transverse Range. Montane, coastal, and Western Mojave Desert ecosystems form an ecotone at lower elevations on north and east facing slopes of the San Bernardino and San Gabriel Mountains. Vegetation is extremely rich including a mixture of 1) typical desert plants such as creosote bush, burrobush, catclaw, desert willow, Ephedra, and Joshua tree at lower elevations, 2) chaparral plants such as scrub oak, lilac, and manzanita, and 3) montane species such as mountain mahogany, juniper, and pinyon pine at elevations over 3,500 feet. Elevation

ranges from 2,500 feet in San Gorgonio Pass to over 5,000 feet in the San Bernardino Mountains. The substrate generally consists of sand, gravel, pavement, or boulders but is usually rocky.

Wildlife species also exhibit a mixing of coastal and desert species with Gambel's and California Quail and Ladder-backed and Nuttall's Woodpeckers overlapping in distribution.

Desert Slopes - Sierra Nevada. The eastern edge of the Sierra Nevada, extending from the Tehachapi Pass area north to Ball Mountain, is strongly influenced by the western Mojave Desert and mountain ranges immediately west. Topography is comprised typically of rounded and weathering foothills of conglomerate or volcanic origin interspersed with canyon systems that provide a natural "funnel" for invasion and colonization from surrounding habitats. Intermittent streams and springs in many of these canyons support a comparatively dense vegetation canopy. Lower elevations consist of creosote-burrobush scrub with saltbush, occasionally Joshua trees, cholla, and beavertail cactus. Higher elevations contain stands of pinyon-juniper woodland. Elevation ranges from 2,800 to 6,200 feet.

Some of the more typical wildlife species found in this area include sideblotched lizards, common kingsnakes, California Quail, Black-throated Sparrow, white-tailed antelop squirrel, black-tailed jackrabbit, Tehachapi slender salamander, and San Joaquin pocket mouse.

Desert Slopes - Peninsular Ranges. This ecosystem is characterized by steep mountian ranges with granitic, boulder-strewn slopes. Elevations range from 500 to over 5,000 feet. This area is not only a transition zone between Colorado Desert and coastal ecosystems but between faunas characteristic of northern and Baja California. The extremely diverse vegetation is dominated by creosote and burrobush with frequently large stands of yucca, golden cholla, ocotillo, barrel cactus, and brittlebush at lower elevations. Pinyon-juniper woodland is present above 3,500 feet, with a varied understory consisting of century plant, scrub oak, prickly pear cactus, and many grasses. Mountain rainfall during the summer months provides a source of water for many plants and animals. Numerous permanent springs are also present.

Many wildlife forms found in the CDCA occur only in this transition zone; some of these are representatives of the Baja California fauna. Examples include Peninsular bighorn sheep, magic gecko, banded rock lizard, and red diamond

rattlesnake. In addition, coastal and desert wildlife species occur in close proximity as in other transistion zones.

REFERENCES

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Part II

INVENTORY AND DATA SOURCES

The purpose of this part is to provide the reader with information on materials used in preparation of the wildlife portion of the "Affected Environment," Environmental Impact Statement. The massive wildlife data base compiled since 1974 through the California Desert Plan Program formed the foundation of the Affected Environemnt. Between 1974 and late 1976, data gathering centered around four geographic areas of the California desert; Saline Valley, Inyo County; the western Mojave Desert in eastern Kern and western San Bernardino counties; the eastern Mojave Desert, San Bernardino County; and the Yuha region, southwestern Imperial County. Some desert-wide information was gathered at the same time.

In late 1976 the focus changed to a desert-wide approach. At that time, data gathering was divided into two major subject areas -- compilation of existing information and acquisition of new information. Existing information consisted of 1) museum records of vertebrates; 2) records from the published literature on vertebrates with particular attention to their occurrence, abundance, habitat preferences, status, and impacts to habitats and populations; 3) field notes and from professors and universities; 4) sight observations from field notes and from BLM-sponsored studies; 5) unpublished reports or technical reports distributed by state and Federal agencies or private sources; and 6) identification and description of potentially unique and sensitive areas, as well as representative ecosystems; and 7) identification and description of potential Areas of Critical Environmental Concern. The kinds and extent of the data base are described in more detail below.

SOURCES OF EXISTING INFORMAION

Museum Records

Several major and minor museums have specimens of vertebrates that have been collected in the California desert between the late 1800s and the present.

Over 15,000 records of fishes, amphibians, reptiles, mammals, birds, and egg clutches were examined in several museums and institutions in California. These included the Western Foundation of Vertebrate Zoology; Natural History Museum, San Diego; Los Angeles County Museum; San Bernardino

County Museum; Riverside County Museum; Museum of Vertebrate Zoology, University of California at Berkeley; and California Academy of Sciences. These records were prepared for computer storage and retrieval and will be retrievable by general location and by species at some time in the future.

Records from the Published Literature

There are numerous published papers on the distribution of various groups of species (bats, birds, reptiles, etc.) for the California deserts. Some are old; others are more recent. Examples of older papers include "The biota of the San Bernardino Mountains" by J. Grinnell (1908), "An account of the mammals and birds of the Lower Colorado Valley, with special reference to the distributional problems presented" by J. Grinnell (1914), "Mammals of Death Valley" by J. Grinnell (1937), and "A synopsis of the bats of California" by H.W. Grinnell (1918). Newer accounts were also helpful, such as "A distribution of the birds of California" by J. Grinnell and A.H. Miller (1944), "Endemic birds of the Little San Bernardino Mountains, California" by A.H. Miller (1946), "Vertebrate inhabitants of the pinyon association of the Death Valley region": by A.H. Miller (1946), "A preliminary account of the herpetofauna of the Saline Valley hydrographic basin, Inyo County, California" by B.H. Banta (1962), "The lives of the desert animals in Joshua Tree Naitonal Monument" by A.E. Miller and R.C. Stebbins (1964), "A survey of the birds of Death Valley" by R.H. Wauer (1962), and "Ecological distribution of the birds of the Panamint Mountains, California" by R.H. Wauer (1962), and "Ecological distribution of the birds of the Panamint Mountains, California" by R.H. Wauer (1964). It should be emphasized that the above are only a few of these kinds of documents. Such sources provided information on locations of species, habitat preferences, periods of activity, habitat condition, and relative abundance at a particular time or during a stated time span.

Journals such as American Birds (formerly Audubon Field Notes) contained many valuable records for bird distribution on a seasonal basis.

Field Notes from Professors and Institutions

Field notes were examined for information on locations of vertebrates and for site-specific descriptions of habitat condition. The field notes of several dozen biologists at the Museum of Vertebrate Zoology, University of California

at Berkeley and at the Western Foundation of Vertebrate Zoology provided useful information.

Sight Observations

There are literally thousands of reliable sight observations of many species of vertebrates, particularly the larger mammals. Sources include the records of California Department of Fish and Game, State and National Park Services, Bureau of Land Management, and contractors for various agencies. A system was developed for recording this information on standardized forms. The sight records have been placed in computer files; these must be checked for accuracy before retrieval can begin.

Unpublished and Technical Reports

There are hundreds of papers, reports, masters' thesis, and dissertations that are unpublished, "in preparation," "in press," in draft form, or in the form of in-house or open-file reports, technical reports circulated by an agency, or administrative reports. These were difficult to find and obtain. Many were acquired through contacts with colleagues in wildlife, ecological, zoological and other professional societies.

Reprint and Card File

Since 1974, books, papers, and articles dealing with deserts in general, the California desert, species occuring in the CDCA, censusing techniques and inventory methods, and management opportunities and methods have been collected and placed in "reprint" files. Card catalogs were established for the reprint file (subject and author), as well as for other articles, books, and papers of interest not in the Bureau office. During the course of the compilation of bird bibliographies, card catalogs (by author) were also established. Thus there is another, although incomplete, source of information.

COMPILATION OF EXISTING INFORMATION

Because of the vast amount of literature on the 640 vertebrate species and the hundreds of potentially sensitive or significant invertebrates, it was necessary to compile bibliographies and summary reports. Annotated bibliographies were prepared through contracts on 116 species of birds and 45 species of mammals. Staff members prepared annotated bibliographies for several species of reptiles and amphibians. Bibliographies (nonannotated) were also

compiled for about 100 species and subspecies of reptiles and amphibians. These bibliographies are not exhaustive. Instead they focus on topics of use to wildlife management: distribution, habitat preferences, population parameters, seasons of use, status of populations, and potential sources of impacts.

Summary papers were prepared for some officially listed, sensitive, proposed sensitive, and significant species. Summary papers included discussions of significance, geographic distribution (worldwide, California, and CDCA), habitat, impacts, population status in the CDCA, and current studies.

Major annotated bibliographies also were prepared by staff and through contract on general subjects (for example, effects of livestock grazing on vertebrates and their habitat; the effects of noise on nonhuman vertebrates). Less formal bibliographies were compiled by staff members on resource uses that can affect wildlife resources (for example, off-road vehicles; wild horses and burros; oil, gas and geothermal development; general recreation; energy-related developments such as utility corridors, transmission lines, powerplants, wind generation sites, and pipelines and aqueducts); transportation; harvesting of animals; research and education uses; military training exercises; hazardous and nonhazardous waste disposal; and fire management and prevention.

BLM FIELD STUDIES AND RESEARCH

Studies of Officially Listed, Sensitive, and Significant Species

Numerous studies were undertaken on both vertebrates and invertebrates. Among these were 1) survey of dune systems for beetles (Andrews et al. 1979); 2) surveys for the Andrews' dune scarab beetle and other endemic dune beetles of the Algondones Dunes (Hardy and Andrews 1979); 3) searches for and determination of the distribution of a new, rare species of slender salamander (Giuliani 1977); 4) searches for a new, rare species of gecko (Fritts 1979); 5) studies on the distribution and abundance of the flat-tailed horned lizard (Turner et al. 1978; Turner et al. 1980); 69 studies on the distribution and status of the desert tortoise (summarized in Berry and Nicholson 1979); 7) studies on the effects of paved roads on desert tortoises (Nicholson, in prep.); 8) surveys for Prairie Falcons and Golden Eagles (Boyce 1977; Siperek 1977; Thelander 1977; Alten 1977; BLM staff 1978-1980; Harmata et al 1978); 9)

surveys on the distribution and status of the Inyo Brown Townee (Cord and Jehl 1979); 10) population studies on the desert kit fox (O'Farrell and Gilbertson 1979); 11) studies on the movements of bobcats (Zezulak and Schwab 1979); and 12) studies on the habitat preferences of the Mohave ground squirrel (Wessman 1977, Wessman and Berry, in prep.).

Baseline Studies on Groups of Species by Habitat Type or on Specific Habitats

Selected groups of invertebrates were surveyed. Among these were invertebrates of desert playas (Kubly and Cole 1979); ants (Snelling and George 1979); robber flies (wilcox 1979); butterflies of the Algodones Dunes (Powell 1978); Aculeate hymenoptera (Griswold 1979), and bee flies (Hall 1979).

Studies on reptiles and amphibians were undertaken by contractors in several different regions such as 1) Mojave River area (Brown 1978); 2) Coso Mountains (Brown and Groman 1979); 3) southwestern Imperial County (Fritts 1978); 4) eastern slopes of the Sierra Nevada (Goodrich 1978); Clark Mountains (Mitchell 1978); eastern Mojave Desert (McGurty 1977); and San Felipe Creek (McGurty and Ruth 1978). Brown (1978) and McGurty and Ruth (1978) also studied fishes.

The BLM supported general staff studies on amphibian and reptile surveys in the Yuha Basin (Berry et al 1974), in the western Mojave Desert (Berry et al 1976), and Saline Valley (Mangan and Hirt 1977).

Winter and breeding bird surveys were funded for 80 permanent study plots; surveys for four seasons were supported at 13 of these sites. The list of contributors and authors is exhaustive; almost all such studies have been published in American Birds or Western Birds.

Bird surveys covering a large area were undertaken by Remsen (1976) in the Eastern Mojave and by Zembal, Massey and LaRocque (1978} in Rose Valley and the Coso Mountains (also published in American Birds). Remsen, Cardiff, and Hale (1977) also studied avifaunas of white fir forests in the Kingston, Clark, and New York Mountains. Staff member A.S. England undertook a study on the use of water sources by birds at 14 sites (data not analyzed as of April 1980).

Mammal studies were undertaken primarily by the wildlife staff. Over 400 new trapping locations provided data on small mammals, primarily 30 species of rodents. Greater attention was given to certain regions, such as the Yuha Basin (Berry et al 1974), western Mojave Desert (Berry et al

1975), Saline Valley (Mangan and Hirt 1977), eastern Mojave Desert (Berry et al 1976), parts of the Colorado Desert Associated with the Sundesert project (BLM, Riverside Office), Salton Sea (BLM, Riverside Office), Cadiz Valley (BLM Riverside Office), and Afton Canyon (Desert Plan Staff). Small contracts were awarded for work in the Rose Valley-Coso Mountain area (Leitner 1979), and for bats and carnivores in the Colorado Desert (WESTEC Services, Inc. 1977). One wildlife staff member of the Desert Plan staff compiled bobcat fur trapping records and trapped, tagged, and released bobcats at a few limited localities; that same employee also worked on distribution of mule deer in the southern deserts.

Of particular importance in the study of small mammals was the collection of voucher specimens. Over 18,000 voucher specimens from these studies are preserved at the Los Angeles County Museum of Natural History; all have been identified to species and, in some cases, to subspecies.

Studies of Impacts on Wildlife and Wildlife Habitat

It is to be noted that many of the studies listed below were of a relatively short-term nature and predictions or abstracting of information must be related on that basis. Many studies were undertaken to determine the actual or potential effects of various human related uses on wildlife and wildlife habitat. Examples of some projects are effects of sheep-grazing on Mojave Desert vegetation (Webb 1979); effects of general recreation on the avifauna of riparian systems (Weinstein 1978); impacts of off-road vehicle noise on three species of vertebrates (Boyer et al. in prep.); effects of Mojave yucca harvest on the avifauna (Cardiff and LaPre 1980); and the extent of past military maneuvers in the southeastern deserts (Stialstra, in prep.).

In addition, impacts of various land uses on wildlife and wildlife habitats were summarized in brief papers by Desert Plan Staff wildlife employees. There are summary papers on wild horse and burros; off-road vehicle use; oil, gas and geothermal development; transportation facilities; wind generation sites; pipeline and aqueducts; fire management and prevention; harvesting of animals; noise; and research and education.

Delineation and Mapping of Wildlife Habitats

One of the goals of the wildlife staff was to map all of the 100 or more distinct wildlife habitats at a scale of 1:100,000 or at a scale of 1 inch to 1.6 miles. This has

been accomplished for several areas by the staff, contractors, academicians, and others but not, as of this date, for the entire desert. The mapped areas are Saline Valley; parts of Rose Valley and the Coso region; parts of Death Valley; the western Mojave Desert; the eastern Mojave Desert (specifically the East Mojave planning unit); the Yuha Basin and Yuha planning unit; the Santa Rosa Mountains and Joshua Tree National Monument. Parts of the Sundesert corridor that have been mapped include the literature (Death Valley and Joshua Tree National Monuments), aerial photographs at scales of 1:20,000 and 1:62,500, photographs of specific areas, plant transects and surveys of specific areas, and a great deal of personal field experiences. If this analysis is completed, additional sources of information will be used, including low level, aerial transects and Landsat imagery.

Delineation and Mapping of Human-related Uses

Several resources activities were mapped at scales of 1:250,000 and 1:500,000 by specialists in various fields. Examples of important maps include visitor use concentration areas; private lands, particularly railroad-owned lands; agricultural development areas; areas grazed by cattle and sheep; locations of herds of wild horses and burros; locations of small towns and cities; locations of off-road vehicle open areas (authorized) and unauthorized use areas; locations of existing and pending oil and gas leases; and locations of 1940-1945 military maneuvers and associated disturbed habitats.

Identification and Description of Unique and Sensitive Areas and Representative Ecosystems

Sources of information included the literature, BLM contractors and contract reports, desert experts, and staff members. Maps were drawn up with outlines of unique and sensitive areas and representative portions of major ecosystems. Boundaries were drawn after extensive discussion by terms of knowledgeable staff members.

Delineation of Areas of Critical Environmental Concern

Part of the BLM's mandate for the California Desert Plan was to identify Areas of Critical Environmental Concern (ACEC). Using guidelines published in the Federal Register, the wildlife staff considered approximately 90 areas. Eighty were found to qualify for more intensive consideration. Special reports were prepared for these areas. Each report contains information on the description of the area,

relevance, importance, criticalness, protectability, special management requirements, pertinent literature, and a map.

PART III

IMPACT ASSESSMENT TECHNIQUES

The Methodology used to determine the impacts of each alternative can be divided into four phases.

Phase 1. Compiling existing data on the effects of a particular resource activity on wildlife species and habitats.

Phase 2. Determining the acreage and portion of a species range or special habitat area affected by a single resource activity.

Phase 3. Predicting the nature and severity of impacts of a single resource activity on wildlife resources. Whenever possible and appropriate, impacts were rated on qualitative and quantitative scales.

Phase 4. Assessing the cumulative impact of all resource activities on wildlife resources when considered simultaneously.

Sources of information used during Phase 1 include: published literature, technical reports and papers, unpublished research, BLM contracts and reports, and personal observations. Several in-depth annotated bibliographies and papers were prepared on selected impact topics to summarize and to analyze critically the available information and data. Papers analyzing the effects of a single resource activity on wildlife included: general recreation, geothermal development, utility corridors, wind generation plants, agricultural and urban developments. Annotated bibliographies were prepared on wild horse and burro grazing and livestock grazing.

In Phase 2, the amount of known or potential habitat was estimated for State and federally listed species, BLM sensitive species, and significant species. Species ranges were determined from an analysis of published literature, museum records, BLM contract reports, and site records of State, Federal, and independent biologists. The acreage in each special habitat area was also determined.

Three analytical techniques were used in Phase 3 to predict the nature and severity of impacts: 1) direct comparisions of cause and effect; 2) indirect comparisions of cause and effect; and 3) best professional judgment of one or more experts. Direct comparisions of cause and effect were

possible in many cases where studies had been conducted at the same sites subject to a proposed activity, i.e., the effects of general recreation on birds in Afton Canyon, the effects of motorized vehicles on vertebrates in Dove Spring Canyon, and the effects of burros on vegetation in the Panamint Mountains. Indirect comparisions of cause and effect involved analyzing studies in similar or comparable areas and extrapolating results to site-specific areas in the CDCA. Examples using this technique included: comparing impacts of feral burros on wildlife habitat along the Colorado River and in desert parts of Arizona with potential impacts on similar habitats in the CDCA; and extrapolating impacts of paved and dirt roads on various species of wildlife from numerous published articles of research done elsewhere in the U.S. Best professional judgement was used when similar studies and data were lacking. Professional judgment was used also throughout the impact assessment process when applying indirect cause and effect techniques. In general, the most reliable technique is the direct comparison, followed in descending order by indirect comparisons and best professional judgments.

In Phase 4, cumulative impacts were estimated for each listed, sensitive, proposed sensitive and significant species, and special habitat areas.

Transparent maps of all other resource activities and Multiple-Use Classes were overlaid and a cumulative impact map compiled. Cumulative impact overlays were developed using the three techniques already described.

The cumulative overlays were then placed over the species and special range maps, and areas of overlays were measured. The proportion of range falling into each impact severity category was then computed and those values were placed in cumulative impact tables for wildlife values.

A. CULTURAL/NATIVE AMERICAN ELEMENT ON WILDLIFE

Methods of Determining Impacts

The positive and negative effects of managing cultural resources and Native American values on wildlife species and habitats were determined in a two-step process;

1) Identification of the types of impacts created by implementing each management guideline or activity, and

2) Analysis by plan alternative of the wildlife resources affected by specific management proposals.

Data were compiled on the types of active management programs proposed in the Archaeological-Historical Resource Zone, Public Interpretive Use Zone, and Archaeological-Historical Preservation Zone included in the Cultural/Native American Element. Other management proposals in the element and management constraints included in the cultural resources and Native American values section of the multiple use guidelines were also analyzed. Subsequently, staff specialists on cultural resources and Native American values were interviewed to determine the precise nature of specific actions allowed or encouraged under each management category. The data gathered were used to determine whether proposed Cultural Resources/Native American values management techniques would have beneficial, detrimental or no impacts on wildlife resources.

To assess the effects of the Cultural Resources/Native American element on wildlife resources, a map depicting specific management actions was overlaid on wildlife resource maps showing habitat for Federal endangered species, state-listed rare ad endangered species, and selected significant species, and on maps showing special habitat areas and wildlife management areas. The kinds of wildlife resources and multiple use class falling within each Cultural Resources/Native American Values resource management area were recorded.

Nature of Impacts

Most management guidelines and programs proposed in the Cultural Resources/Native American values element are designed to protect those resources through limitations on incompatible and destructive uses, and through increased enforcement of regulations. These management actions would provide protection to important wildlife resources found within Archaeological-Historical Resource Zones, Public

Interpretive Use Zones, and Archaeological-Historical Preservation Zones, and may therefore be beneficial to wildlife.

A few specific cultural resource activities could have limited direct negative impacts on wildlife resources, others have indirect effects by limiting wildlife management activities. Conflicts are usually confined to a small area and would be serious only if near a sensitive wildlife resource such as an important water source, raptor eyrie, or habitat for rare, threatened, endangered, sensitive or significant species. Excavation techniques destroy wildlife habitat; the area disturbed is usually small unless unusual research techniques are employed (e.g., Davis, 1978). Habitat disturbances are most likely to occur near oasies, where wildlife and human use concentrate. Preservation techniques such as rodent control to prevent destruction of artifacts and disturbances to strata, and construction of flood diversion dams to protect large sites could have local deleterious effects on wildlife resources, but are used infrequently. Increased visitor use at interpretive sites may cause trampling of habitat and other disturbance to wildlife.

Guidelines and activities for management of Native American values are also designed generally to protect existing values, and are beneficial to wildlife. The only apparent area of potential conflict is harvesting of native animals for ceremonial uses. However, the number of animals taken is small, and the general goal of most Native Americans is to manage animal populations in a condition that would allow harvesting for traditional uses (Robert Laidlaw, pers. comm).

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B. IMPACTS OF GENERAL RECREATION ON WILDLIFE

Methods of Determining Impacts

Five methods were used to gather information about actual and potential positive and negative impacts of general recreational activities on wildlife: a review of the literature, information from contractors working in the field between 1974 and 1979, the collective experience of California Desert Plan Program wildlife staff members in the field, information from the California Desert Plan Program recreational staff members, and best professional judgment based on the above four.

Fellers (1979) undertook an analysis of the literature and prepared separate reports for the following topics: birdwatching, camping and picniking, driving on unpaved roads, equestrian use, falconry, hiking and rock climbing, photography, rock and mineral collecting, sightseeing, target shooting, painting, hang gliding, sand sailing, hunting, and research and education. In some cases, information contained in California Desert Plan Program contracts was incorporated into these reports. Wildlife contractors also volunteered information about their contacts (if any) in the field with general recreation users. In some cases, contractors described situations in their reports or field notes (i.e. Cord and Jehl, 1979; 1979, Weinstein, 1979; O'Farrell, 1979; Fritts, 1979; Harmata, Geduldig, and Durr, 1979; McGurty and Ruth, 1978; McGurty, 1979; Remsen, 1976).

The wildlife staff members who have been involved in desert studies for the last several years contributed valuable information on effects of camping, shooting, hunting, research and education, photography, rock and mineral collecting, falconry, and many other subjects. The information was usually site-specific and dated.

Information from the California Desert Plan Program recreation staff members was derived from such sources as the report by Stanford Research Institute (SRI) International (1978) on "Demographic and Economic trends in the California Desert", the paper prepared by Stebbins et al. (1977) entitled "Teaching and Research in the California Desert", a report by Environmental Information Service (1977) on "A study of organized recreation group use in the California Desert", a Field Research Corporation (1977), report entitled "California public opinion and behavior regarding the California Desert", and a Natelson Company, Inc. (1978) report entitled "A study of recreation use at

selected locations in the California Desert." In addition, a map which showed concentrated recreational use zones with the number of visitor-use days/mile 2 was used. The map, prepared by the recreation staff, was derived using the above reports, as well as an analysis of CDCA aerial flight data from 1973 to 1978 and a map showing intensity of use nodes (1979). It was a key element in evaluation of the existing situation for baseline levels of impacts. The existing situation (as of January 1979) was used in all cases for comparison of the No-Action and action alternatives. However, in calculating potential impacts to wildlife resources over the next 10 years, conservative estimates were used. It is likely that impacts may be more severe than noted.

Nature of Impacts

The following summary of impacts was taken from a review of the impacts of various forms of recreation prepared for the Bureau of Land Management by Joan Fellers (1979). Both negative and positive impacts occur, and specific types of impacts may result from one or more forms of recreation. The following are several examples.

Specific negative impacts have been identified for such activities as trapping, hunting, bird watching, camping and picniking, driving on unpaved roads, esquestrian use, falconry, hiking and rock climbing, photography, rock collecting, sightseeing and indiscriminate shooting or "plinking". Negative impacts as a result of hunting and trapping include wildlife population declines, skewed age and sex ratios, reduction in food for the natural predators of game species, disturbance of species intolerant to human activity (such as bighorn sheep) intense disturbance of vegetation, wildfires, littering, soil compaction, contamination of water supplies, disturbance of breeding behavior in birds, and general vandalism may result from camping, picniking and equestrian use. New trails may also be created by equestrian use. Other specific types of impacts that result from the remainder of the recreational pursuits mentioned previously include: disturbance of nests and breeding behavior in birds, destruction and disturbance of habitat, destruction and/or removal of animals from populations, collection of animals, and increased mortality of wildlife along roadsides.

Many positive impacts on wildlife can result from recreational pursuits also. Such beneficial impacts have been identified for nearly all forms of recreation noted in the previous paragraph. An appreciation of wildlife and

natural habitats and an increased desire to protect natural wildlife resources are potential beneficial impacts common to most forms of recreation. Such pursuits such as raising of revenue for wildlife management through hunting and fishing licenses, regulation of game populations, installation of water sources in arid areas, and increasing knowledge of predator populations (trapping). Commercial collecting and falconry can provide animals for use in scientific and educational programs and produce data on breeding techniques and conservation practices. The use of films and photography may result in the further promotion of wildlife appreciation.

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C. IMPACTS OF MOTORIZED VEHICLE ACCESS ELEMENT ON WILDLIFE

Methods for Determining Impacts

Techniques to determine the kinds and degree of impacts of the Motorized Vehicle Access Element on wildlife include review of published and unpublished literature (including Bureau-sponsored studies), examination of aerial photographs, and personal expertise of staff specialists based on actual visitation of many sites during the last 10 years, and on slide collections of impacts at particular sites. The wildlife resources that might be affected by open areas were identified by overlaying maps showing open areas for the No-Action and action alternatives upon maps showing wildlife resources (officially listed, sensitive, "proposed" sensitive, and significant species, as well as representative ecosystems and unique or sensitive habitats). The amount of a specific wildlife resource occurring within each open area was recorded in square miles. Information on important wildlife resources immediately adjacent to the open area was also noted. Wildlife resources affected by either the designation or existing roads and ways classification were assessed in a similar manner. Maps showing the location and distribution of C, L. and M classes were placed over maps showing the various wildlife resources; the amount of a specific wildlife resource occurring within each land-use class was then recorded in square miles.

In all cases, the existing situation and condition of the land with regard to wildlife resources were used as a baseline for measuring amount, type, and degree of impact. The Interim Critical Management Plan for Off-road Vehicles was incorporated as part of the baseline. A map showing the locations of unauthorized vehicle-use areas was used in considering the existing condition of the wildlife habitat.

NATURE OF IMPACTS

General Effects

Off-road vehicles are known to have impacts on vertebrate species and their habitats. Luckenbach (1975) and Stebbins (1974) have described general impacts to certain wildlife species and to habitats. More site specific discussions relating to the effect on habitat soils can be found in Eckert et al. (1977), Gillette et al. (1979), Nakata et al. (1976), Synder et al. (1976), Stull et al. (1979), Webb (1978), Webb et al. (1978), and Wilshire and Nakata (1976, 1977, and 1978). Papers describing impacts on vegetation in

the Mojave Desert include: Davidson and Fox (1974), Duck (1978), Keefe and Berry (1973), Johnson et al. (1979), and Lathrop (1979).

In a study of the effects of ORV's on desert vertebrates in the west-central Mojave Desert, Bury et al. (1977) noted that numbers of reptile, bird, and mammal species in pit areas and other heavily used areas were 20 percent and 55 percent of undisturbed areas.

Recent studies have shown that the hearing abilities of birds (Marler et al. 1973), certain mammals (Bondello and Brattstrom 1979b), and some reptiles (Bondello et al. 1979) can be permanently impaired by motorcycle and dune buggy noises. Hearing loss in the Mojave fringe-toed lizard and desert kangaroo rat occurred after a 500 second (8 1/2 minutes) exposure of vehicle noise at 95dB (Bondello and Brattstrom 1979a,b). Bondello et al. (1979) found that Couch's spadefoot toads would emerge from burrows following 10 to 30 minutes of recorded motorcycle sounds in a laboratory experiment. Similar studies by Weinstein (1978) and Luckenbach (1978) indicate that most birds avoid areas used intensely be ORV's.

Off-road vehicle use affects Desert tortoises by 1) direct killing of tortoises on the surface or in subsurface burrows, 2) crushing nest pits of eggs, 3) damaging habitat used for cover (i.e. compacting soil needed for burrow construction, crushing burrows, destroying perennial and annual vegetation), and 4) damaging habitat components used for forage (e.g. crushing plants used for food, compacting soils so food plants will not germinate, foresting growth of unpalatable weeds) (Bury 1978; Berry and Nicholson 1979). Tortoises are also shot by recreationists. Another and more difficult topic is the effect of noise on desert tortoise. Based on recent studies by Bondello and Brattstrom (1979) of other species of small desert vertebrates. As discussed in the pervious section, there are indications that ORV noise might affect tortoise hearing sensitivity.

In a special study of the effects of ORV's on desert tortoises in the Stoddard and Johnson Valley Open Areas (central Mojave Desert), Bury (1978) found marked reductions in tortoise numbers in pit areas and other heavily used areas. Data gathered desert-wide on tortoise populations (Berry and Nicholson 1979) and new data gathered in spring 1979 (Barrow, field notes) indicate tortoise populations are estimated to have declined from densities of 200 per square mile down to 100 per square mile in the <u>least disturbed</u> areas of Stoddard Valley within the <u>last 4 to 5 years</u> and

are still declining. Data from the Rand Open Area on tortoise populations is available for 1976, 1978 (Berry and Nicholson 1979), and for spring (Stewart, field notes). The data again are for a "least disturbed" area and indicate declines of 5 to 10 percent per year.

Flat-tailed Horned Lizard. This species is limited to a few areas in the Colorado Desert.

Studies by Dr. Fred Turner (1978, 1979) have revealed that there are few areas within the geographic range of this species where densities are high or moderately high. However, in most areas there are few lizards and few lizard signs. Four areas of crucial habitat have been outlined (Turner, pers. comm.). All or portions of two of these areas are open areas in one or more of the plan alternatives. Museum and old collecting records indicate that at one time additional areas had high concentrations.

ORV use can have impacts on the flat-tailed horned lizard, especially when heavy use is confined to a few square miles. In general, these impacts are crushing of the lizards on the surface and in subsurface burrows or subsurface resting sites; damage to vegetation that provides forage for the prey (ants); damage to the ant mounds and nests (again, damage to prey); and noise, which may reduce hearing sensitivity (Bondello and Brattstrom 1979). Studies by Bury et al. (1977) on lizards (including horned lizards) and small vertebrates indicate that heavily used off-road vehicle areas have impacts on species.

Colorado fringe-toed Lizard. Impacts are similar to those described above for the flat-tailed horned lizard. In addition, Bury's (1978) report outlined impacts specifically on the Colorado Desert fringe-toed lizard. He found 61 fringe-toed lizards in three two-hectare control plots where there was no ORV use.

Prairie Falcon and Golden Eagle. Prairie Falcon and Golden Eagle foraging areas, eyries, and breeding areas will be affected by open area designations. Each pair of Prairie Falcons uses from 40 to over 60 square miles of habitat (Harmata et al. 1978). Each pair of Golden Eagles uses from 25 to 50 or more square miles for foraging habitat (Olendorff, pers. comm.). Using these foraging areas, England (1979) had identified eight core habitats for these raptors in the CDCA. The core areas have the highest known densities currently and historically of Prairie Falcons and Golden Eagles in the CDCA.

According to Harmata et al. (1978), Prairie Falcons avoided parts of their foraging areas that were used by weekend recreationists and return only after visitors had left. Their studies were performed in the Red Mountain-Spangler Hills area, and there are also data from field surveys in the general vicinity of the Spangler Hills Open Area. Falcon eyries at Castle Butte and Robber's Roost have been disturbed regularly by ORV and other recreationists, and nesting failures have been documented (BLM contract field notes for Boyce, Harmata, Woodman, etc.).

Shooting of and at raptors in the Mojave Desert has been recorded on a number of occasions by California Desert Program contractors and personnel as well as California Fish and Game wardens (Boyce, BLM Contract field notes; Harmata, pers. comm., etc.).

In addition, ORV's have deleterious impacts on small vertebrates taken as prey by raptors. Bury et al. (1977) found that vertebrate numbers were decreased by 55% and 20% in heavily used and pit areas, respectively, and biomass by 23% and 17%. Byrne (1974) and Busack and Bury (1974) had similar findings for mammals and lizards, respectively. Animals studied included those in the diet of these raptors (Thelander 1974, Garrett and Mitchell 1973). Prairie Falcons take reptiles and small diurnal rodents, occasionally birds, whereas Golden Eagles feed on rabbits and rodents in this part of the desert. Thelander (1974) has noted that "those areas where human activity has included the destruction of golden eagle foraging areas, prey populations or nesting sites, permanent exclusion of nesting golden eagles has occurred."

Desert Bighorn Sheep. Bighorn sheep are sensitive to noise, human presence, and other related probelms. Lambing occurs within the period of February to May. Nervousness and stress, both physiological and mental, in ewes can affect lambs (Hansen 1971). Sheep are especially bothered by irregular human disturbance of areas such as lambing grounds or water sources. Irregular bighorn use may occur as a result of increased use by ORV. Jorgensen (1974) reported that bighorn sheep in Anza-Borrego State Park decreased their use of a watering area by nearly 50 percent on days when vehicles were used in the area.

Mule Deer. Unrestricted ORV activity can be expected to damage vegetation used for forage and cover; intrusion of vehicles and noise will affect breeding and other behaviors. Noise levels may be high enough to frighten these animals from their foraging and breeding areas into less optimal

habitats. Poaching, spotlighting, and general harassment may cause further pressure on herds. Deaths may result from collisions.

Mohave Ground Squirrel. It is confined to the western Mojave Desert and has a geographic range that extends from immediately south of Owens Lake south into the Antelope Valley and east generally to Searles Valley and from the vicinity of Ft. Irwin in the north to Apple Valley in the south. Approximately 50 percent of the geographic range is in private holdings, and may be no longer suitable for Mohave ground squirrels.

Off-road activity affects the ground squirrel and its habitat by 1) direct mortality from vehicles, 2) crushing vegetation used for cover and forage, 3) crushing burrows, and 4) through noise, which may deafen individuals and cause behavioral changes and increased susceptibility to predation. The studies by Bury et al. (1977) and Byrne (1973) have demonstrated impacts of ORV's in the western and west-central Mojave on small vertebrates in moderately used, intensively used, and pit areas. Although there is little data available for ORV's on Mohave ground squirrels, we assume similar patterns to that found by Bury et al. Byrne noted that in Dove Springs Canyon (where the squirrel occurs in relatively undisturbed habitat), "Judging by the results of the ... trapping, this squirrel would not continue to survive in this area if damage became more extensive." Since the time that Byrne undertook the Dove Springs study, the habitat damage has become more extensive: the gradual growth of intensively disturbed areas in Dove Springs Canyon had been documented by Webb (1978).

Upland Game. Studies (Bury et al. 1977, Luckenbach 1978, Weinstein 1979) indicate that ORV's have impacts on upland game. ORV's can damage vegetation used for forage, cover and nesting sites, can crush or otherwise damage nests, can disturb birds through the presence of vehicles and noise, and can ultimately destroy habitat. According to California Department of Fish and Game biologists (R. Reser, etc.), the Rand Mountains once supported excellent populations of Chukar, Gambel's Quail, and Mourning Dove.

Burrowing Owl and Desert Kit Fox. Both are effected by moderate to intense ORV activity. Their population densities are low, and they rely on burrow or den systems for cover. They also are dependent on a good supply of rodents for food. ORV activity would have impacts on both the prey supply (Byrne 1973, Bury et al. 1977) and on burrows/dens. O'Farrell an Gilbertson (1979), in a

1978-1979 study of the desert kit fox in the vicinity of the Rand Open Area and Desert Tortoise Natural Area, noted the importance of natal dens to the kit fox and suggested that further studies should be done to determine if ORV activities can trigger cave-ins of dens and if harassment of occupied dens occurs through noise and vibrations of ORV's passing over them.

Dune Systems, Endemic Beetles, and Specialized Vertebrates. Sand dune systems are isolated habitats, essentially islands surrounded by areas of more common, wide-ranging habitat types. Because of their isolation, they often support unique floras and faunas that have evolved in response to the specialized sandy environment. Hardy and Andrews (1976) summarized how use of vehicles on dunes can adversely affect arthropods: 1) by destruction of host plants for those species which require living plant material on the dunes; 2) by destruction of plant material on the areas around the dunes, thus removing the source of wind-drifted vegetable matter; 3) by breaking up accumulations of dead vegetation either on or near the surface of the sand, thus exposing immature stages to unnatural environmental conditions; 4) by breaking up and mixing crustal layers or compacted sand, depriving burrow-forming animals of suitable substrate; and 5) by disruption of reproductive behavioral patterns of narrowly adapted species. Hardy and Andrews (1976) noted that the endemic, sand-loving beetles are exposed to one or more of the above factors.

As reported previously, Bondello and Brattstrom (1979) undertook a special study on the effects of vehicle noise on another desert lizard, the Mojave fringe-toed lizard. They found that dune buggy sounds of 95dBA (100dBL) and a cumulative exposure time of 500 seconds severely impaired the hearing. This level of sound is equivalent to those actually monitored from concentrated dune buggies in the desert at distances of 50 meters from the sound source. Bondello and Brattstrom (1979) did not consider shallow burial of lizards in sand as an adequate escape from dune buggy noise. They also suggest that the importance of hearing to the lizards is probably related to prey acquisition and predator avoidance. Bury (1978) documented the effects of ORV's on sand dwelling lizards in the Algodones Dunes. He found significant differences in lizard density and biomass between ORV used and relatively undisturbed areas.

The desert kangaroo rat is a species of limited distribution and localized occurrence. It is found only in areas of windblown sand and is considered to be highly specialized.

Bondello and Brattstrom (1976) state that this species is totally intolerant of disturbances caused by ORVs. ORVs cause destruction to habitat by caving in burrows and by reducing plants used for cover and forage, such as Indian rice grass and certain species of Atriplex. In addition, these investigators report that vehicle noise can damage hearing as previously stated. Other aspects of behavior are also likely to be affected (e.g., courtship, reproduction, territoriality, care of young).

The Effects of Designated Roads and Ways at Existing Roads and Ways on Wildlife. Will vary with the number and location of roads designated for motor vehicle use. In general, restricting access to any area benefits wildlife by preventing or greatly reducing the area suffering the impacts described. Wildlife populations and habitat will be affected along roads, near developed, undeveloped, or primitive camping areas, and around high density visitor use areas in the following ways:

1. direct mortality,
2. noise,
3. disturbances during critical breeding periods,
4. fragmentation of habitat,
5. establishment of undesirable exotic plants on road shoulders and other disturbed areas,
6. destruction/degration of habitat

Specific wildlife resources and habitats such as raptor eyries, washes, riparian areas, springs, and restricted habitats and or species with extremely limited distributions may be disturbed. The desert tortoise, Mohave ground squirrel, flat-tailed horned lizard, bighorn sheep, and other more widely distributed wildlife species could be affected if the number of roads is too great.

Since roads will be designated after the Desert Plan is adopted, there will be an interim period for each area when lands placed under designated roads and ways will be open for use on existing roads and ways. During this time wildlife resources falling within the designated roads and ways motor vehicle use classification may be subject to the reported negative effects. The magnitude and extent of the affects will vary with length of this interim period and intensity of visitor use.

Numerous studies on paved roads have shown that direct or indirect mortality can have an effect on wildlife populations. Strom et al. (1976) estimated that red fox road kills accounted for 11 percent of the total annual

mortality. Dickenson (1939) found 75 kangaroo rats trapped in a one mile section of paved highway which had recently been oiled. Welsh (1971) stated that 20 percent of the bighorn sheep deaths surveyed were the result of highway fatalities and 12 percent were from fence mortality. Robertson (1930) observed 104 road-killed birds along a 9 mile section of paved road in one year. Hodson (1962) stated that birds were killed when feeding on insects or carrion, dust-bathing, taking grit, flying low, or striking telephone wires. Nicholson (1978) found a decrease in desert tortoises densities with decreasing distance from a paved highway; the roadside population may have succumbed to highway mortality and collecting for pets.

Recent studies have shown that the hearing abilities of birds (Marler et al. 1973), mammals (Bondello and Brattstrom 1979b), and reptiles (Bondello et al. 1979) can be permanently impaired by motorcycle and dune buggy noises. Studies by Weinstein (1978) and Luckenbach (1978) indicate that most birds avoid areas intensely used by ORVs, reducing the chance of incurring hearing damages, but creating an area with lower breeding bird densities.

Disturbances during critical breeding periods may lead to reproductive failure. Raptors are generally more susceptible to disruptions in the breeding cycle during territory establishment and early incubation. Prairie Falcons may abandon an eyrie following a single short visit either before or during laying (Frye and Olendorff 1976). Haramata (1978) observed reactions of several Prairie Falcons to motorcycles and vehicles during the breeding season in the Western Mohave Desert. An incubating female stood up as a trail bike noise reached its maximum level and settled back down to incubate as the nose faded. The motorcycle was not visible to the observer one-half mile away. At another eyrie the male would often leave the vicinity of the eyrie and fly over vehicles passing on a trail 0.8 miles away. As the vehicle continued past, he would fly off or return to the eurie. At another eyrie, after leaving her nest, the female would spend much of her time on the higher mountain slopes during weekends when vehicular traffic was heavy in the flats.

Roads may fragment habitat, preventing movement of wildlife. Oxely, Fenton, and Carmody (1974) suggested that highways serve as barriers between populations of small mammals. Existing literature on this topic is sparse, with virtually nothing done on the effects of dirt roads.

Soil disturbances along road shoulders, ways, and

infrequently used roads facilitate the establishment of weeds such as Russian thistle (Wilshire 1977). Many of these plants are not utilized by wildlife. Russian thistle is neither a major nor a minor food item of the desert tortoise, and, when the plants are extremely dense, may actually prevent tortoise movement or block burrow openings (Berry and Nicholson 1979).

Around frequently used campsites, soil will be compacted, vegetation may be crushed or cut for firewood. This is especially true in washes and other highly valuable wildlife habitat where campers park close to trees and springs (Luckenbach 1978, Weinstein 1978). Desert bighorn sheep are also prone to disturbances by man (DeForge 1972, Graham 1971) and are especially sensitive near water sources (Jorgensen 1974).

Desert tortoises are frequently taken for pets and used as targets (Berry and Nicholson 1979); raptors (Murphy et al. 1979, Boeker and Ray 1971, Seidensticker and Reynolds 1971, Snow 1972, 1973, Snyder adn Snyder 1975, Harmata et al. 1978) and kit foxes (O'Farrell and Gilbertson 1979) are common targets for shooters.

Desert sand dunes are among the unique ecosystems in the CDCA. They are limited in distribution and support a group of species highly specialized for survival on sandy substrates. Among these are numerous species of endemic dune beetles (Andre et al. 1979) and three species of fringe-toed lizard (Stebbins 1966). Populations may be affected directly when vehicles crush animals on or in the sand (Photograph in the Enterprise - Feb. 19, 1979; Hardy and Andrews 1976).

Desert washes are among the most productive habitats in the CDCA. The large shrubs and trees provide added structural diversity; they also provide food, cover, nesting sites, and perches for numerous species that don't occur in other desert habitats or are found at much lower densities away from wash habitat. Winter bird population surveys have shown 1.3 to 4.5 times more species and densities 1.4 to 13 times higher in washes than in other Colorado desert habitats (Tomoff 1975a, b, c, Johnston and Foster 1979, Daniels 1979a, b, Jehl 1979). Breeding bird densities in Colorado Desert washes ranged from approximately 1/3 to 74 times that in bajadas and mountain habitats with species diversities in washes 1/2 to 7 times as high (Johnston and Foster 1979, Daniels and Boyd 1979a, b, Carlson 1979, Franzreb 1978). In the Mojave Desert, Remsen et al. (1976 a, b, c) found winter bird densities 50 to 60 times higher

in a catclaw-rabbitbrush wash than in surrounding open desert communities. Likewise, breeding and wintering bird densities and diversities are considerably higher in mesquite habitats found throughout the desert than in more typical desert scrub habitats (Evens 1979a, b, Stewart 1979a, b, c, d, Weinstein and Berry 1978a, b, Cardiff and Cardiff, 1979, Zembal et al. 1979a, b, Landry 1979). In addition to breeding and wintering birds, migrant birds also use washes heavily, washes support high densities of lizards and mammals and are used by mule deer, quail, and other game species.

A recent study by Luckenbach (1978) in the Mojave and Sonoran Deserts has shown reductions in the use of washes by breeding birds. Moderate ORV use reduced the number of breeding species by half. Heavy use in one study plot eliminated all breeding birds. In a comparison of two ironwood washes, the one not used by ORVs had 23 times as many breeding birds as the one frequented by vehicles.

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D. IMPACTS OF THE WILDERNESS ELEMENT ON WILDLIFE

Methods of Determining Impacts

The effects of wilderness classification on wildlife species and habitats were assessed through 1) a review of the existing literature, 2) examination of applicable Federal laws and acts, and 3) a review of the Proposed Plan and alternatives. The literature review provided information on the role of wilderness management to wildlife resources, the kinds of impacts and their effects on wildlife, the criteria for wilderness classification, and the wilderness inventory process. The Federal Land Policy and Management Act and Wilderness Act contained statements of policy, definitions of terms, and constraints on certain uses. The Desert Plan contained two essential parts: (1) numbers and sizes of Wilderness Study Areas under various alternatives and (2) guidelines for land use restrictions in Wilderness Study Areas. These included guidelines for livestock grazing, motorized vehicle use, utility construction, various recreational pursuits, mineral exploration and development, and habitat manipulation.

The potential effects of Wilderness Study Areas and wilderness designations were determined by overlaying wildlife resource maps on maps of the Wilderness Study Areas. Measurements were then made of the amount and kinds of wildlife resources in each Wilderness Study Area. Examples of wildlife resources that were evaluated include: State and federally listed and sensitive species, some significant species, and unique and representative wildlife habitats.

Nature of Impacts

Although wilderness designations are expected to have impacts on wildlife resources through preservation of habitats and strict constraints on development, impacts will vary depending upon such factors as the number and size of wilderness areas; type, location, and number of wildlife species and unique habitats; and classification of adjacent lands. The overall impact rating assigned each plan alternative was dependent upon these factors.

Designated wilderness areas can have an effect on their constituent wildlife through restrictions on consumptive uses such as motorized vehicle access, livestock grazing, feral horse and burro herds, mineral exploration and development, utility construction, and agricultural use. Impacts of wilderness designation on wildlife may occur from

restrictions on development-related projects such as spring stabilization, removal of exotic vegetation, or trucking of water supplies into remote areas to refill critical watering tanks.

Wildlife populations and habitats managed as part of designated wilderness areas can serve several positive functions; these include

(1) providing "core" populations of representative plant and wildlife species,
(2) preserving species and habitats of limited distribution,
(3) preserving species and habitats that are highly susceptible to human disturbance,
(4) serving as a gauge with which to monitor changes in adjacent areas exposed to modification or alteration by human-related activities,
(5) serving as a reservior of genetic variability for future needs,
(6) providing essential breeding habitat for seasonal use for some populations (e.g. lambing grounds, nesting sites) (Hendee et al. 1978).

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E. LIVESTOCK GRAZING ELEMENT: IMPACTS TO WILDLIFE

Mehtods of Determining Impacts

The first step in analyzing impacts was to determine important wildlife resources occurring in each allotment. Wildlife resource maps were used to identify federal and state-listed species, BLM sensitive species, proposed BLM sensitive species and special wildlife habitat areas within allotments. The amount of a special wildlife habitat area occurring within each allotment was determined by overlaying grazing allotment maps on wildlife resource maps and measuring the amount of overlap in square miles. These measurements were then converted to acres.

The types of impacts expected in the plan alternatives were determined on the basis of: (1) a comprehensive scientific literature review, (2) field observations by the wildlife staff, (3) letters and photographs from the general public, (4) personal communications from professional biologists outside the Bureau of Land Management and (5) best professional judgment.

Using the above sources of information, impacts were evaluated in each allotment on the basis of: class of livestock, season of use, range type, type of grazing system (i.e. Allotment Management Plan), priority for implementing grazing system, condition of the range for livestock, a separate condition rating for wildlife, number and type of range improvements, turnout dates, watering and handling requirements, forage readiness requirements, maximum utilization levels, allocation of forage in relation to carrying capacity, and allocation of forage in relation to No-Action Alternative. Also taken into consideration was the class designation of each allotment, as management practices regarding wildlife resources vary by class. The "action" alternatives were evaluated using the No-Action situation as a baseline for comparison. The No-Action Alternative was evaluated on the basis of effects expected if the current 1979 situation continues for the next 20 years.

The evaluations were based on the following assumptions:

1. Range condition as stated in the livestock grazing element does not always reflect the requirements for wildlife.
2. No Allotment Management Plans would be prepared or implemented in the No-Action Alternative.

3. In the Action alternatives, prescribed management practices as well as specific management practices regarding the Desert Tortoise, Bighorn Sheep and riparian areas, as stated in the Livestock Grazing Element, would be initiated upon implementation of the Desert Plan and complete implementation would be achieved within 5 years after allotment management plans are approved.
4. In the Action alternatives, wild horse and burro numbers within high priority HMAPs would be reduced within 5 years the medium priority within 9 years and low priority within 13 years, to proposed levels and maintained at those levels. In the No-Action Alternative, wild horse and burro numbers would be maintained at 1979 levels.
5. Population estimates of wild horse and burros within allotments are reasonably accurate.
6. Carrying capacity of allotments are reasonably accurate.

The range condition ratings for each allotment reflect an average, overall evaluation based on the requirements of livestock. The requirements of wildlife vary from those of livestock. In addition, those areas considered critical to wildlife (such as riparian areas) are often in poorer condition than the overall average rating of the remainder of the allotment.

The overall impact of each allotment on wildlife for the No-Action Alternative was based on best professional evaluation, with all factors previously discussed being taken into consideration.

The overall impact of each allotment to wildlife in the No-Action, Use, Balanced, Protection and Proposed Alternatives was based on a checklist and factor rating form designed to insure consistency, as well as objectivity. The purpose in creating this checklist was to insure that each allotment in the Action Alternatives was evaluated equally, using the currrent 1979 situation as a baseline for comparison. The checklist was not used for the No-Grazing Alternative because it is not a comparable action.

The following is a discussion of how criteria and variables were used in the analysis:

Each category was used as judged appropriate; not all criteria were applied to every allotment or horse/burro management area.

PER labled variables applicable to perennial allotments

EPH labled variables applicable to ephemeral allotments

Perennial/Ephemeral allotments were evaluated using both PER & EPH variables

Wild Horse and burro land management areas were evaluated using PER labeled and unlabeled variables

Proposed condition/trend and carrying capacities were used for all allotments.

CRITERIA/VARIABLES EXAMINED FOR ACTION ALTERNATIVES

A. AUM Allocation (PER): for extreme differences the highly positive or negative category was used - no substantial impact was about +(-) 10% of the given value.

   1. Compare to No-Action
   2. Compare to Carrying Capacity

B. Wildlife Conditions: current condition of wildlife habitat within livestock allotments were evaluated by K. Berry.

C. Turnout at 200# (EPH):

D. Management Systems: Not applied.

E. Season of use: Not generally applied.

F. Class of Livestock: Not generally applied - input only when a certain class of livestock has known or predicted impacts on wildlife (e.g. domestic sheep and botfly problems on bighorn sheep).

G. Improvement:
   1. Water:

   2. Fence:

H. Specific Decisions: used only when appropriate - taken from steering committee decisions.
   1. Bighorn Sheep (PER):

   2. Tortoise (EPH):

I. Priority for Implementation (Proposed only)

J. Implementation Proposal: only proposed alt-depends on bighorn decision - does not duplicate rating under bighorn/tortoise categories.

The overall impact of the grazing element and the wildhorse and burro element was determined by using a weighted average of the rating. Each rating for impact level was assigned a value as follows: highly negative = 1; Negative = 2; No substantial impact = 3; positive = 4; highly positive = 5. The allotment or the HMA rating was multiplied by the public land acreage within the respective allotment or HMA, all weight ratings were summed and divided by total acreage.

Nature of Impacts

The largest number of livestock occurred in the western United States during the first part of this century when the sheep industry was at its maximum. However, forage demand for western livestock today is high as the result of growth in cattle numbers (Wagner 1978).

Livestock grazing within reasonable limits is compatible with the existence of many wildlife species. However, grazing does cause a shift in plant species composition (Weaver and Clements 1938, Blydenstein et al. 1957, Ellison 1960, Wagner 1978 and others). As vegetation composition is altered through grazing, wildlife may be affected by even subtle changes while range condition remains favorable for livestock (Wagner 1978). Consequently, a change in animal species composition can be expected as a result of vegetative changes due to grazing. Generally, those species with limited distributions and specialized habitat requirements are likely to be most affected. The impact of livestock grazing on wildlife and wildlife habitat varies, depending on a number of factors, some of which include: class of livestock, season and intensity of use, type of grazing system, location and number of range improvements, condition and trend of range and length and history of livestock use. Impacts also vary depending on the group of animal or habitat type:

Invertebrates

Recent studies (Morris 1967,1968,1969,1971) indicated that insects are more abundant in ungrazed areas than in adjacent grazed areas. Invertebrates comprise an important food source for many species of amphibians, reptiles, birds and small mammals.

Amphibians and Reptiles

Impacts to amphibians and reptiles include trampling of individuals and burrows, loss of cover and reduction in insect prey items. Certain species of reptiles are found to increase while others decrease as a result of vegetation change (Jones 1979; Boyer, in prep.). Thus animal species composition can be expected to change as a result of vegetative change due to grazing.

In a study on the effects of sheep grazing on lizards in the western Mohave Desert, Busack and Bury (1974) found that an ungrazed creosote community had twice the number of lizards and 3.7 times the biomass of comparable grazed areas. The negative effect of grazing was attributed to loss of cover, reduction in invertebrate food sources, disturbance of social structure and direct casualties.

Livestock grazing may have detrimental effects on tortoise populations (Woodbury and Hardy 1948; Coomb 1974, 1977; Berry 1978). Berry (1978) has presented circumstantial evidence that livestock grazing may have a deleterious effect on desert tortoise by reducing forage, trampling shelter and cover sites, and in some instances, trampling tortoises. She noted specifically that livestock grazing can 1) reduce the food supply and thus increase the time of individual tortoises to reach maturity, 2) reduce the number of clutches provided by adult females, 3) alter age class composition of a population to a situation where adults predominate, 4) contribute to an imbalanced sex ratio favoring males, and 5) increase mortality rates in adult female and small tortoises through forage loss and trampling. Adult female and small tortoises are more susceptible than other groups because of small home ranges, fragile shells, and high energy commitments. Studies have been undertaken throughout the Southwest on desert tortoise; there are indications of widespread declines, with grazing being a probable contributing factor.

Birds

Livestock grazing affects bird populations through loss of cover and nesting sites, reduction in insect prey items and competition for forage. As with other groups of animals, vegetation changes induced by livestock grazing also can be expected to alter avian species composition. In northeastern Arizona, Monson (1941) found the effect of increased food and cover on ungrazed plots more than doubled the bird populations. Populations of Dickcissels and Bell's Vireos were 50 percent lower on grazed than on ungrazed

lands in Oklahoma (Overmire 1963). Smith (1940) also found that birds disappeared from overgrazed lands in Oklahoma. A number of studies have demonstrated higher reproductive success and increased production of waterfowl on ungrazed plots or those managed by rest rotation (Bue et al. 1952, Kirsch 1969, Gjersing 1975, Mundinger 1976 and others). Important food plants for Gambel's Quail in Arizona have been removed by livestock grazing, according to Gorsuch (1934) and Gallizioli (1976). Reproductive efforts of wild turkeys in Arizona are less successful in grazed areas, apparently because of reduced nesting cover (Gallizioli 1976). Removal of cover for Scaled Quail due to grazing has been observed in west Texas (Wallmo 1956). Buttery and Shields (1975), in a paper which reviewed a number of studies, stated "effects of grazing most often depend on its intensity and localization. High intensity grazing profoundly alters breeding avifaunas from the natural site, generally in the direction of decreased species numbers and complexity." However, light to moderate grazing would probably not be detrimental to most rangeland birds (Buttery and Shields 1975, Weins and Dyer 1975).

The effects of grazing on predatory birds such as the Golden Eagle and Prairie Falcon which require open foraging habitat may vary with the complex interactions between vegetation structure and composition and prey availability. Overgrazing to the point where prey species decline and plants providing perch sites are not perpetuated can be detrimental to raptors. In some habitats not previously damaged by overgrazing, light to heavy grazing may increase some rodent populations (see small mammal section) and therefore be beneficial to raptors. Not only may prey items be more abundant in some grazed areas, but vulnerability to predation is also presumably higher (Snyder and Snyder 1973). However, Olendorff and Stoddard (1973) found that small mammals in a short grass prairie were generally most abundant in ungrazed or lightly grazed habitat. In general, the majority of CDCA rangelands have been moderately to heavily grazed, with some areas subject to periodic overgrazing (P. Ernst, per. comm.). Signs of recent overgrazing (within the last 5 years) are visible in localized areas of the eastern Mohave Desert, western Antelope Valley and the eastern slopes of the Sierra Nevadas (H. Johnson, per. comm.).

Small Mammals

A change in mammal species composition can be expected as a result of vegetative changes due to grazing. Vegetative shifts may be beneficial for species such as the

black-tailed jackrabbit and Merriam's kangaroo rat which appear to require more open habitat systems. Other species such as cottontail rabbits, harvest mice and pocket mice which require a more dense overstory of vegetation are found to decrease in response to grazing pressure (Phillips 1936, Stoddard and Smith 1955, Reynolds 1958, Ellison 1960, Black and Frischnecht 1971, Martin 1975, Dick-Peddie 1976 and others).

Livestock grazing may affect small mammals through trampling of burrows and individuals, loss of cover, reduction in insect prey items and direct competition for forage.

Large Ungulates

Competition between livestock and bighorn sheep exists for forage, water and space. This has been documented in Idaho (Morgan 1971), Colorado (Packard 1946, Bear and Jones 1973), Wyoming (Crump 1971), Texas (Davis and Taylor 1939), New Mexico (Gordon 1957, Sands 1964), Utah (Wilson 1968, Dean 1975), Arizona (Russo 1956, Gallizioli 1976) and Nevada (Albrechtsen and Reese 1970, Ferrier an Bradley 1970, McQuivey 1978).

In Nevada, McQuivey (1978), reported a considerable amount of evidence to substantiate the results of competition. There has been reductions or disappearance of desert bighorn sheep from several areas following introduction of domestic livestock. Desert Bighorn were eliminated from Elko County just after livestock use was most intensive. Before livestock use began (late 1800s), the bighorn was the most common large mammal. The last desert bighorn sheep was seen in the area in 1921. Similar trends are documented for Washoe, Humbolt, Churchill and White Pine counties. The grazed areas have .88 sheep/mi^2-, the ungrazed have 2.54 sheep/mi^2.

Several authors have reported competition for space between bighorn and domestic livestock. In all cases reported, the results indicated limited use of the habitat by bighorn or abandonment (Irwin 1969, Wilson 1969). In Arizona, the disappearance of bighorn in many ranges seems to coincide closely with the spread or introduction of cattle in those areas and there is presently no range in Arizona where there is a thriving population of bighorn where cattle are being grazed (Gallizioli 1976).

Several recognized bighorn sheep experts have stated that in order to maintain or improve sheep populations, livestock must be segregated from bighorn sheep ranges, either by

seasonal grazing restrictions (graze only when the sheep aren't using a range) or by physically prohibiting all livestock use within bighorn sheep areas (Russi, Richard Weaver, Robert Weaver and Wilson pers. comm.). The primary conflict identified in this communication was competition for space. Examples cited were: Kofa Game range in Arizona where bighorn won't tolerate cattle in their habitat; Aravaipa Canyon in Arizona where bighorn sheep were observed to leave their inhabitated area after the introduction of cattle; and in the In-ko-Pa Mountains where, as cattle encroached on bighorn sheep habitat, sheep use of the area declined.. There were other examples given where removal of livestock from bighorn sheep ranges resulted in increased bighorn sheep numbers. Examples given were Challis, Idaho, where the sheep increased from 42 prior to livestock removal to 92 three years later (Wilson pers. comm.). There is some evidence (McQuivey 1978) that bighorn use areas simultaneous, with livestock only when that use is necessary for survival i.e. ingress and egress to water. During aerial and ground observations of the Highland Range in Nevada, 90% of 300 observations of bighorn sheep occurred in those portions of the range inaccessible to livestock, even though most of the area provides good sheep habitat.

If something happens to cause bighorn to abandon a portion of their ranges or if migration routes are destroyed, traditional or historic habitat use will not be resumed even though the habitat may be otherwise suitable. New traditions can be established by reintroductions, providing the reason for the original abandonment has been removed (Geist 1971).

Chronic sinusitis resulting from botfly infection has been identified as a serious source of desert bighorn mortality (Bundy and Allen 1980). Introducing livestock into bighorn populations that are not now infected with botfly parasition greatly increase the potential for infection.

Mule deer and livestock may compete for desirable browse species. Short (1977) found that deer in southern Arizona grasslands did not eat appreciable amounts of grass, the preferred forage of cattle. However, cattle did consume browse species utilized by deer. Competition could be expected to be most severe during years of low rainfall, in seasons when browse availability is limited or where the range is in fair or poor condition. Light to moderate livestock grazing is usually not detrimental to mule deer and competition is usually low on ranges which are in good condition (Hill 1956, Truett 1972, Martin 1975). However, on overgrazed ranges, cattle will eat browse species

preferred by deer (Gallizioli 1976).

Wash Habitats

Relatively high soil moisture levels along desert washes generally support better developed and more productive vegetation than adjacent bajadas and lowland habitat. Plant cover is generally higher, shrubs are bigger and trees are often present. This increased structural diversity and habitat richness generally supports a much greater diversity and density of wildlife than more common desert scrub habitats. Excellent data exist illustrating the importance of this habitat to birds. Food, cover, nesting sites and perches in wash habitats support a number of species that do not occur in other desert habitats or are found at much lower densities. In the eastern Mojave Desert, Remsen et al, (1976a, b, c) found wintering bird densities 50-60 times higher and species diversity 4-8 times higher in a catclaw-rabbitbrush wash than in surrounding open desert communities. Mesquite thickets associated with washes found throughout the desert are also highly productive. Stewart (1979a, b, c, d) found 50 percent more breeding bird species and three times as many wintering species in the mesquite thickets at Salt Lake, Inyo County, California, than he did in a sagebrush community approximately twelve miles north. In addition to more species, breeding bird densities were nearly four times higher. Similar trends are also found when Stewart's results are compared to studies in a creosote bush scrub community in Kern County near the Desert Tortoise Natural Area (Landry 1978, 1979). In the southern deserts, winter bird population surveys have shown 1.3 to 4.5 times more species and densities 1.4 to 13 times higher in washes than in other Colorado Desert habitats (Tomoff 1975a, b, c, Johnston and Foster 1979, Daniels 1979a, b, Jehl 1979). Breeding bird densities in Colorado Desert washes ranged from approximately one-third to seventy-four times that in bajadas and mountain habitats with species diversities in washes one-half to seven times as high (Johnston and Foster 1979, Daniels and Boyd 1979a, b, Carlson 1979, Franzreb 1978). In addition to breeding and wintering birds, washes are also heavily used by migrants. They support high densities of lizards and mammals and are important to mule deer, quail and other game species. Fusari (1977) sampled small rodents at ten sites in the Colorado Desert and trapped more animals in a wash habitat than any other.

Riparian Habitats

Riparian habitats, including marshes, cottonwood-willow vegetation and mesquite thickets, are the CDCA habitat types

most important to wildlife. Nine of ten officially listed species, thirteen of twenty-two proposed BLM sensitive vertebrate species, as well as most game animals occurring in the CDCA rely on riparian habitats during all or part of their life-cycle.

Riparian habitats are extremely important to birds. Many species do not occur in the drier habitats, while others can be found outside riparian zones, but much lower densities. Winter bird populations in cottonwood-willow habitat at Fort Piute are nearly 100 times as dense as in surrounding desert habitats (Kubik and Remsen 1977a&b, Remsen 1977). Nine-hundred Mourning Doves have been counted there in a single morning and as many as 200 pairs have nested in the woodland itself (Remsen unpubl. field notes). Breeding and wintering bird studies in riparian thickets at Afton Canyon support greater numbers of species than any other desert habitat (Mack 1979a). Riparian habitat at Corn Springs supported thirty-one species of wintering birds at concentrations of nearly 1200 birds/100 acres, a figure surpassed only by the Chuckwall Valley Dune thicket, a riparian/wash habitat type (Mack 1979b).

Breeding bird densities in mesquite thicket/salt bush/salt cedar communities are up to 50 times higher than drier scrub habitats and supports up to 10 times as many species (Evans 1979a, Stewart 1979a,b, c, Weinstein and Berry 1978a, b, Cardiff et al. 1978, Johnston and Foster 1979a, Foster and Johnston 1979a, Remsen et al. 1976, Kubik and Remsen 1977). Winter bird populations have 1 1/2 to 13 times as many species at densities 1 1/2 to nine times that of bajada and valley habitats (Evens 1979b, Stewart 1979d, Weinstein 1979a, b, Cardiff and Cardiff, 1979, Zembal et al. 1979a, b, Landry 1979, Johnston and Foster 1979b, Foster and Johnston 1979b).

With one or two exceptions, all amphibians occurring in the California desert are restricted to riparian situations. This includes isolated populations of coastal forms such as the Pacific slender salamander and the entire range of two newly described salamanders. The state-listed rare black toad is found only in a few springs on private land in Deep Springs Valley, Inyo County.

Free surface water found in riparian areas is essential for many mammal species, including mule deer and bighorn sheep. Species such as the Amargosa vole and Mohave vole are known only from marsh habitats in riparian areas.

The water and lush vegetation of riparian habitats are

heavily used by livestock as well as wildlife. Stocking rates on public lands are based on animal unit months (AUMs) with the number of animals permitted in an allotment being determined by its total area. However, cattle do not distribute themselves evenly over all terrain, preferring moderate topography and ready access to water (Wagner 1978). Ames (1977), Kennedy (1977) and many others have shown that cattle concentrate in riparian areas. Duff (in press) found that riparian vegetation declined 35 percent in six weeks when cattle were introducted to an area that had not been grazed for four years.

General effect of grazing on riparian habitats and wildlife is highly significant since riparian areas are the most productive desert habitats and support the majority of listed species, proposed BLM sensitive species, and significant species.

Range Improvements

Livestock water developments which increase the amount of water available or provide it where there was none may be beneficial. Probably the most detrimental effect of water development of any kind is the overuse and resulting deterioration of the area around the water source. The vicinity around the water developoment becomes a loafing area for livestock, causing damage to vegetation and soil, and destroying ground cover and nesting habitats (Buttery and Shields 1975). Heavy grazing and trampling may occur within several hundred yards to a mile of the water source.

Fences probably have little effect on bird, small mammals or reptile populations. They can provide hunting perches for raptors, flycatchers and shrikes and nesting areas for other birds (Buttery and Shields 1975). Fences can potentially cause injuries to bighorn (Helvie 1971) and deer. Bighorn are found in relatively low population levels in many mountain ranges and corridors between mountain ranges allow populations to move to other ranges when conditions become less favorable, such as an extended drought. Fences may restrict these types of movements, as well as seasonal migration.

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F. IMPACTS OF WILD HORSE AND BURRO ELEMENT ON WILDLIFE

Methods of Determining Impacts

Wild horses and burros, especially burros, are distributed widely over the CDCA. Currently numbers of these animals are at high levels and are directly and indirectly impacting wildlife populations in many areas. Numbers apparently have increased since the passage of Public Law 92-195 which protect these animals from a variety of man-induced population manipulations. Prior to passage of the law, animals were removed with little or no planning, that is there was no management of populations.

Assumptions:

The Wild Horse and Burro Element of the Desert Plan was evaluated on the basis of a number of major assumptions. These assumptions are:

1. Population estimates of wild horses and burros are reasonably accurate.

2. Wild horse and burro recruitment rates (birth and immigrations) - (deaths and emigrations), which were not addressed in the Wild Horse and Burro Element, approach 15% per year. Field data indicated that population recruitment rates vary between 10 and 30 percent per year. (Carothers, pers. comm.; Ohmart, pers. comm.; Seegmiller, pers. comm.).

3. Populations under the No Action Alternative will be held to 1979 levels, as specified in the Wild Horse and Burro Element.

4. Populations under the Action Alternatives will be reduced to and maintained at projected levels. The Wild Horse and Burro Element does not specify when control would be initiated or when reduction to specified levels would be completed. For the purposes of the wildlife impact analysis it was assumed that control measures would be initiated in FY 81 and that reduction to the population levels specified in the element would be reached within five years (October, 1985), for the high priority HMAPs and that all reductions would be completed by October 1989.

5. Range conditions as displayed by the Wild Horse and Burro Element do not necessarily reflect the requirements for wildlife.

The above assumptions are based on what was discussed in the Wild Horse and Burro Element. Based on costs, past management practices and assumed difficulties in attaining the goals stated in the Wild Horse and Burro Element, a number of predictions can be made relative to the validity of the assumptions.

The accuracy of current populations estimate is questionable. Estimation of burro numbers without marking and recapturing animals

does not provide an accurate estimation of numbers (S. Carothers, per. comm; R.O. Ohmart, pers. comm; R. F. Seegmiller, pers. comm.) and may significantly underestimate the size of burro populations. Without accurate baseline information, aerial monitoring techniques might be highly unreliable. If burro populations are greater than estimated, the cost to reduce burro numbers to their specified levels would increase; concommitantly the probability that those goals for reduction would be reached will decrease and the severity of impacts on wildlife would be greater than the analysis indicates.

Projected reductions in horse and burro numbers from 1979 estimates, No Action - 0 percent, Proposed - 73 percent, Protection - 63 percent, Balanced - 65 percent and Use - 68 percent, are large reductions and would reduce wild horse and burro impacts on the range. It was assumed that reductions would reach specified levels within five years of plan implementation to the high priority HMAP areas and nine years in the remainder. Within this period , the range would decline further. Reduction would probably not improve sensitive areas such as riparian areas and water sources. Wild horses and burros require these areas for shade and water, hence even though reductions occur, use of these areas would continue. Impacts on bighorn sheep would not decline appreciably; forage and water sources would receive severe impacts.

Projected reductions in horses and burros range from 63 percent under the Protection Alternative to 73 percent under the Proposed Alternative. There is a difference of 1148 horses and burros removed between the Protection and Proposed Alternative.

Range condition and trend information from the Wild Horse and Burro Element was collected using techniques by range conservationists. These assessments do not always agree with assessments made by wildlife biologists on the same herd management areas. The differences in ratings occur largely because of the objectives of the rating systems. Range conservationist rate quality of range land on the basis of what conditions are best for wildlife. The ratings are averages of the condition of each herd management area; that is some parts of the management areas are in better condition and other parts are in poorer condition than the ratings indicate. Much of the most valuable wildlife habitat, such as riparian areas, is found in parts of the herd management areas heavily used by burros; such areas would probably have a lower condition rating than the herd management area overall.

Techniques:

Potential impacts on wildlife species and areas were estimated by measuring the areas of overlap between specific wildlife resources and the wild horse and burro management areas. Measurements were made using square mile counters. Then the amount of a particular wildlife resource occuring in a particular herd management area was converted from square miles to acres.

The effects of wild horses and burros on wildlife resources in the CDCA were determined by applying published and unpublished information to each herd management area. Sources of information included: scientific literature, published and unpublished reports, experts in the field (S. Carothers, R.D. Ohmart, R.F. Seegmiller) etc. Several herd management areas were examined by wildlife staff members in the field. Some sites were examined yearly whereas others were visited only once or twice from 1970 to the present. Aerial photographs and transects of herd management areas were also examined.

The initial evaluation of the impacts of this element on wildlife attempts to address the impacts of each specific herd management area upon the wildlife within the management area. The wildlife staff did not have equal amounts of information for each herd management area therefore they could not evaluate in a consistent manner without examination of characteristics which were common to all herd management areas. To permit comparisons between herd management areas, the same checklist rating procedure developed for livestock was used comparing each herd management area on the basis of several variables: range condition, range trend, percent reduction of wild horse/burro numbers, and priority for HMAP implementation. Range condition and trend were considered to be very important for predicting impacts. If the range is fair or poor and declining for example, a 60 percent reduction in horse and burro numbers over 20 years would probably not improve the range to levels where wildlife would be benefited to any great degree. Seventy percent of the concentration areas within herd management areas are in fair or poor condition and are declining. The following paragraph discusses how the livestock checklist rating system was revised for horses and burros. For horse and burro herds within grazing allotments the impact rating was done along with the livestock rating. They were considered in the total use and carrying capacity evaluation categories. For herds outside grazing allotments, the rating system had to be revised because there was no carrying capacity figure available. Reduction in horse and burro herds were based on what the carrying capacity might be. For example, the Panamint Valley herd will be reduced to 50 percent of carrying capacity. For impact rating analysis the following categories were used: 0 percent of carrying capacity = Highly positive; 50 percent of carrying capacity = Positive; and 75 percent of carrying capacity = no substantial impact.

Nature of Impacts

Since the passage of Public Law 92-195, the Wild Free-roaming Horse and Burro Act, by Congress in 1971, horse and burro numbers have increased. Field data indicate that burro populations are increasing at about 20 percent (R.F. Seegmiller, pers. comm) to 30 percent (S. Carothers, pers. comm.) per year in parts of the southwestern United States. It is suspected that horse numbers are increasing at similar rates (Cook 1975). As horse and burro numbers stabilize, their range would deteriorate to such an extent that horse and burro numbers would be regulated by starvation (Cook 1975). Disease (Cook 1975) and predation appear to play a minor role in regulation of populations of

these feral animals. (Seegmiller, 1977).

The majority of the technical papers in the literature concern the impacts by burros rather than horses, thus most of the specific information will address burros which are currently a greater problem in the CDCA than horses. An estimated 8800 burros and 750 horses (Desert Plan - Wild Horse and Burro Element 1980), occur in the CDCA.

Wild horses and/or burros impact wildlife in a variety of ways including:

1) Consumption of similar forage items (Hubbard and Hansen 1975); e.e. diet overlap between burros and bighorn (Browning 1960, McMichael 1964, Russo 1956, Seegmiller 1977, St. John 1975, Walters and Hansen 1978) - diet overlaps between burros and mule deer (Hubbard and Hansen 1975, Koehler 1974, Walters and Hansen 1978).

2) reduction of cover, increasing soil erosion (McKnight 1958)

3) rodents affected by browsing and trampling (Carothers et al. 1976)

4) versatility of burros as foragers (Browning 1960, Carothers et al. 1976, Hansen and Martin 1973, Ohmart et al. 1975, Seegmiller 1977, Walters and Hansen 1978)

5) overgrazing near water sources (Brady and Hanley 1975, Fisher 1975, Hanley and Brady 1977b)

6) consumption of large amounts of forage (Cook 1975, Koehler 1974)

7) removal of selected plant species (Douglas and Norment 1977, Hansen 1973)

8) reduction in plant volumes (Fisher 1975)

9) pulling forage plants out by roots (McKnight 1958)

10) stripping branches from small palo verde trees (Seegmiller 1977)

11) pollution of water sources (Dixon and Summer 1939, Ferry 1955)

12) destruction of improved water sources (Weaver 1972)

13) displacement of bighorn sheep from water sources (McMichael 1964)

14) soil damage and erosion from trailings near water sources (Russo 1965, Weaver 1959)

15) soil compaction inhibits or eliminates seedlings (Farrell 1973, Koehler 1974)

Although a number of these impacts such as fouling water sources (Farrell 1973, Moehlman 1974, Seegmiller 1977, Welles and Welles 1961, Woodward 1976) and displacement from water holes as mentioned by McMichael (1964) (Russi, pers. comm.) can be challenged; it is clear that these feral animals impact wildlife adversely.

The most severe problem regarding the impacts of these animals, may be the slow recovery rate of native vegetation (Weaver 1972).

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G. MINERAL EXPLORATION AND DEVELOPMENT ELEMENT ON WILDLIFE

Methods of Determining Impacts

The potential effects of exploration and development of various mineral commodities (termed "locatables", "leasables" and "saleables") on wildife species and habitats were determined using three techniques: (1) an examination of existing literature, some environmental statements; and policy; (2) field observations on a wide array of exploration techniques and developed areas, and (3) measurement of acreages involved. A review of existing literature and EAR's provided information concerning the methods of mineral extraction; equipment utilized, time frames, potential for irreversible environmental damage, potential for complete reclamation, and constraints placed on development as specified in environmental policy (Federal Land Policy and Management Act, P.L. 94-579). The multiple use class guidelines as described in the plan yielded further guidance.

Several assumptions regarding the impact of mineral exploration and development on wildlife resources were made. These are as follows:

1) mineral exploration, development and extraction on Class C and L designated lands would be more closely monitored than on Class M and I designated lands. A condition specified in the Proposed Plan.

2) environmental damage on Class C and L designated lands, by nature of the more restricted guidelines on development, would be less than on Class M and I designated lands.

3) development of mineral resources has a probability of taking place anywhere within deposit boundaries.

4) the area of known mineral reserves may increase as additional, potentially profitable, mineral resources are discovered.

5) the potential for development throughout the area of a mineral resource exists, subject to a variety of variables, including: (1) class guideline restrictions; (2) environmental law and policy; (3) world market price, (4) current and future extraction technologies, and (5) the domestic and international political climate.

6) mineral extraction, development and exploration will have an effect on all wildlife resources and habitats known to occur within deposit boundary lines.

An assessment of the potential area of impact on wildlife from mineral exploration and development was determined using geologic

resource maps. Maps of potential oil and gas leasing areas, deposits of "locatables" (tungsten, lead, gold, etc.) and "saleables" (gravel and clay deposits) were overlaid on the No Action, Proposed, Balanced, Protection and Use Alternative maps. The total area of each mineral resource catagory present within classes C, L, M and I was then determined for the five plan alternatives. Overall ratings of impact on wildlife resources were given using two criteria: (1) the relative amounts of mineral resources located on use-oriented Class M and I designated lands, and (2) the numbers of listed, sensitive and significant species, and unique or restricted habitats subject to potential loss or degradation. Analysis of individual species and habitats was accomplished by measuring the amounts of a particular wildlife resource present within use-oriented or protection-oriented designated lands in each plan alternative.

No time period for development of existing known mineral resources was utilized for the assessment analysis. The highly fluctuating price in several commodities and surging price of gas and oil may create a demand for development of areas within the CDCA which currently contain unprofitable reserves. Consequently, the exact amount of area of mineral extraction and development cannot be predicted within the twenty year time period of this plan.

Nature of Impacts

Habitat and wildlife loss from mineral exploration and development may result from a number of associated activities, including: (1) construction of roads, drilling platforms, open pits and shafts: (2) grading and trenching; (3) formation of dams and tailing ponds; (4) leaching of toxic chemicals used during the extraction process; (5) removal of vegetation and (6) vehicle use during exploration. Adverse impacts to wildlife population include soil compaction (U.S. Dept. of Interior, Bureau of Land Management 1979b), direct mortality (U.S. Dept. of Interior, Fish and Wildlife Service 1977), removal or collapsing of burrows (Luckenbach 1975), reduction in animal populations (U.S. Dept. of Interior, Bureau of Land Management 1973; Romney et al. 1976), decrease in vigor of habitats (Romney et al. 1979; Gibson 1973; Keefe and Bury 1973; Stebbins 1974), impairment of hearing ability (Stebbins 1974; Bondello 1976; Brattstrom and Bondello 1979; Harley 1977), poisoning from toxic chemicals left in dumps (Thompson 1979) and removal of vegetation during construction activities (Vasek et al. 1975). Other effects resulting from surface mining activities include leaching of stored subsoil materials, topsoil removal covering of wildlife habitat from mine spoils, increased erosion, displacement of mobile species, decrease in nutrient and energy flow to adjacent areas, destruction of less mobile species, destruction of food supplies and cover, and overcrowding and increased competition for resources (U.S. Dept. of Interior, Fish and Wildlife Service 1977). The specific effects of undue degradation of lands by hard rock mining on public lands have

been discussed using examples by Shridas (1977). Deleterious effects to wildlife include increased erosion, contamination of water supplies, rechanneling of critical water supplies and destruction of vegetation.

H. IMPACTS OF ENERGY AND UTILITY ELEMENT ON WILDLIFE

Methods Used in Determining Impacts

The process for determining the nature and intensity of impacts to wildlife resulting from land use designations in the energy and utilities element was begun with a review of available literature on direct and related impacts. A second step was to measure the areas of overlap between critical wildlife resources such as rare, endangered, sensitive or significant species and the components of the energy and utilities element such as transmission line corridors, powerplant sites, microwave towers, wind generation sites, geothermal resource areas and the associated potential generation siting locations. Where specific information was not available concerning potential impacts to individual species or to desert wildlife communities and where information was available on the types of impacts but did not specify the quantitative effects of that impact, i.e., percent reduction of a species' population, professional judgement and personal knowledge from "on the ground' experience was used to predict impacts.

The extensive literature review provided information on methods of construction of utility facilities, land areas required, potential for irreversible environmental damage, methods of partial and complete environmental rehabilitation, and potential beneficial impacts.

All critical wildlife resources were mapped and overlaid with maps of the element components for each alternative. Areas of overlap for each resource and component were recorded and the number of critical wildlife resources affected was noted. These figures varied in each alternative since the number of options for each component differed according to the flexibility of each alternative.

Some components of the energy and utilities element were, of necessity, incompletely specified. For example, the number of options for transmission line corridors varies from fifteen routes in the Protection Alternative to twenty-eight routes in the Use Alternative. Since flexibility is also programmed into the power plant siting phase of the element, a corresponding flexibility was designed into the routes available for transmission lines. The text of the energy and utilities element displays a calculation for a hypothetical number of transmission lines necessary during the period 1980-2000 based on projected demand figures provided by the Joint Utilities Advisory Committee. The minimum number of needed corridors is then calculated, using the assumption that all of the new lines can be concentrated in this minimum number of corridors. Under the constraints of the element it is impossible to predict whether all utility companies will be able to concentrate their transmission lines, pipelines, aqueducts, etc. in that minimum number of corridors. More importantly, even if concentration is possible, it is not possible to know in advance which corridors will be used. Furthermore, there is no guarantee that the projected number of power plants and transmission lines will be

constructed. This is also true of the remaining components of the element, though generally to a lesser extent. Consequently, all wildlife resources which would be affected by any component of the utility element were evaluated as "potentially impacted" during the summarization of impacts.

Information from the literature review was used as a basis for ranking basic types of impact according to severity. Irreversible impacts such as habitat loss and fragmentation were considered to be most detrimental to wildlife. Others, such as noise and air pollution, disturbance of reproductive and other behaviors, introduction of competitive exotic species, and increased perch and eyrie sites for raptors, were ranked accordingly. Some of the information was also used to calculate area of habitat loss and/or disturbance per mile of transmission line or pipeline.

The No Action Alternative was assessed by considering the projected development for the period 1980-2000 as discussed in the text of the energy and utilities element. The No Action Alternative, due to its case-by-case system of evaluating permits for energy and utility development, is less restrictive than the Use Alternative. The Use Alternative has some provisions for regulated development; however, the potential for habitat loss is similar in the No Action Alternative to that in the Use Alternative, and the potential for habitat fragmentation is increased.

Nature of Impacts: Utilities

The various components of the utilities element will involve impacts of several types: habitat loss; disturbance to normal behavior, noise pollution, air pollution, groundwater depletion and contamination, fragmentation of habitat and competition with introduced exotics.

Considering what is known of the effects of the impacts, habitat loss, due to its irreversibility, is evidently the most severe. Some direct loss of habitat would occur as a result of constructing any permanent structure such as powerplants, microwave towers, and geothermal test wells. Estimates of areas required for construction are found in reports prepared by Southern California Edison (1974; 1977), U.S. Dept. of Interior (1975), USDI, Bureau of Land Management (1976). The latter report concluded that geothermal plant construction has its most severe impact on desert washes and other habitats of limited occurrence.

Habitat disturbance may result from a number of activities associated with energy development. Changes in structure and composition of the floral community will bring about changes in faunal communities. Short-to-long-term disturbances stem from reduction in canopy cover, density and diversity of both annual and perennial vegetation and decreased seedling germination (Romney 1976, Gibson 1973, Keefe and Berry 1973, Stebbins 1974, Davidson and Fox 1974).

Others have noted temporary devegetation and introduction of exotic species in construction areas for pipelines and transmission lines which may partially recover in time (Vasek 1975b, Minto 1968, Eadie 1953, Frenkel 1970). Soil compaction associated with root disturbance, degradation of soil biota and soil nutrients as well as increased wind and water erosion (USDI, BLM 1976; USDI, USGS 1978). Destruction of the seed bed and interference of the emergence of new shoots in seedling plants has also been noted (USDI, BLM 1979b). Some revegetation projects have been unsuccessful (Brum 1979).

Graham (1971) discussed the increased access provided to the public by roads associated with utility installations. Trampling, and hunting are more likely to occur in areas where they previously did not. Crushing of Rodent and tortoise burrows and direct collisions with animals by off-road vehicles, noted by Luckenbach (1975), can be extrapolated to the use of construction equipment.

The normal behavior of animals can be disturbed both during and after construction. Interruptions occur during sensitive phases of reproductive behavior (Fyfe and Olendorff 1976, Hansen 1971, Sprock et al. 1967, Office of Naval Petroleum and Oil Shale Reserves 1976). Some bird species are susceptible to collision with or electrocution by powerlines (Crawford and Dunkeson 1974, Woodman personal communication). Pipelines, aqueducts and transmission lines may prove to be barriers to rodent movements (Eadie 1953, Cole 1978). Many populations may drop from overcrowding and abnormal intraspecific competition (USGS 1977).

Relatively little is known about the impacts from overuse and contamination of groundwater. Known sources of these problems are geothermal plants and road construction, (Axtmann 1971, Layton and Erimak 1976, Parizak 1971, Lagenwerf and Specht 1970). The same is true of air pollution impacts; Swanson and Medli (1976) mention detrimental airborne by-products from fossil fuel power plants. Noise levels from construction and operation of energy facilities vary widely and can present problems for some wildlife species. Perry (1971) reported levels of 46 to 61 dB accruing from daily operations of 500 kv transmission lines. Thompson (1979) inferred sound pressure levels of 60-90 dB for geothermal wells and power plants. Sound generation during construction of pipelines had aqueducts has been reported as 70-98 dB (Office of Naval Petroleum and Oil Shale Reserves 1976). Natural ambient sound levels in the desert range from 14 to 66 dB (Bondello and Brattstrom 1978). The responses of some wildlife species to abnormal noise levels are severe (Bondello and Brattstrom 1979a, 1979b, Hurley 1977, U.S. Environmental Protection Agency 1972) and include impaired hearing and stress-producing emergencies by burrow-dwelling animals. Stebbins (1974) reported that some reptiles suffer hearing loss at sound levels of 60 dB. Habitat fragmentation from roads, pipelines, transmission lines and other energy developments can also impact wildlife, but has not been extensively studied. Preliminary information has indicated negative impacts to desert tortoises (*Gopherus agassizi*) (Nicholson, *In prep.*). The net effect of these developments is to create island refuges of habitat

which may or may not be large enough to support viable populations of some species, splitting gene pools and reducing local populations (Oxley, Fenton and Carmody 1974, Meneghin 1977).

Beneficial impacts may result from increased perches and eyrie sites for raptors on transmission line towers and wind generation towers (Rue 1957, Hannum, Anderson and Nelson 1975). Bike paths, such as those built along the California aqueduct, or some other type of recreational pathway, might be developed in conjunction with transmission corridors and reduce recreation pressure in more sensitive areas.

I. IMPACTS OF AREAS OF CRITICAL ENVIRONMENTAL CONCERN ON WILDLIFE

Methods of Determining Impacts - Protection, Balanced, Use

The impacts of Areas of Critical Environmental Concern (ACEC) on wildlife resources vary with the specific proposals included in each ACEC management prescription. Therefore, the impacts of ACECs on wildlife were determined independently for each area. For each ACEC, the wildlife staff was provided with one to four sets of recommendations prepared by various DPS resource specialists. To allow the impact analysis to proceed, the wildlife staff assumed that the most protective set of recommendations would be chosen for the final management prescription. Thus, the impact analysis was performed on a "best case" base.

The beneficial or detrimental effects of each ACEC on wildlife were evaluated by analyzing the effects of specific recommendations in the "best case" management prescription. Impact information gathered while evaluating the plan elements (e.g., recreation, motorized vehicle access, livestock grazing and wild horses) was used in the process. Assumptions were made that implementation of the management prescription would be effective, that desired objectives would be achieved, and that the public would comply with use restrictions.

Wildlife resources affected by each designated ACEC were identified by preparing a map with approximate ACEC boundaries, and overlaying it on wildlife resource base maps. Wildlife values ocurring within each ACEC were recorded and used as the basis for determining probable impacts.

Methods of Determining Impacts - Proposed

The impacts of the Proposed Plan ACECs on wildlife were evaluated as for the three alternatives mentioned above.

Nature of Impacts

Management prescriptions proposed for the 50 accepted ACECs in the Use, Balanced and Protection Alternative and the 73 ACECs in the proposed alternatives are generaly designed to protect natural and cultural resource values. Wildlife resources may benefit from this protection. One possible exception to the generality is the habitat degradation and disturbance to wildlife that will result from higher visitor use resulting from increased public awareness of the areas. Management recommendations included in most prescriptions can be grouped into 14 general categories. Beneficial or detrimental impacts of each are described briefly below:

1) Control Vehicular Use. Eliminating off-road vehicular use will prevent habitat destruction, direct wildlife mortality, and disturbances during the breeding season. This management

recommendation will be beneficial to wildlife. Limiting ORV use in ACECs is beneficial to wildlife, but such restrictions in small areas, especially where a campground is located, have proven to be difficult to enforce and wildlife resources have declined.

2) Remove Burros/Grazing. Fencing riparian areas and springs would prevent over-utilization and trampling of these important wildlife habitat types. Wildlife populations of many species would increase, and new species may invade or return to previously degraded habitats as recovery occurs. In areas where riparian vegetation is only part of the habitat required to protect a species (e.g., Inyo Brown Towhee) fencing only riparian areas and springs would not totally achieve the desired goals.

3) Control Visitor Use and Camping. Habitat degradation and disturbances to wildlife caused by human activity, soil compaction, firewood cutting, etc., would be eliminated, reduced or confined to limited areas if public compliance is achieved.

4) Reduce or Prevent Water Overdraft. This action would protect sensitive and productive marsh and riparian habitats, and would be highly beneficial to wildlife.

5) Prohibit/Control Mining. Limiting or excluding mining from key areas would prevent the habitat destruction associated with most operations.

6) Restrict Collecting. A management recommendation that would prevent the removal of sensitive natural resources would benefit wildlife.

7) Remove Exotic Vegetation. Undesirable salt cedar may be removed from riparian and marsh habitats in selected ACECs. Native vegetation may be re-established and encouraged through active management. Wildlife populations may increase and new species may invade or return as recovery occurs.

8) Increase On-the-Ground Surveillance. Frequent ranger patrols would promote compliance with other management guidelines and increase the effectiveness of protection afforded to wildlife resources.

9) Stabilize/Rehabilitate Features. Most efforts to stabilize or restore cultural resource values are compatible with or beneficial to wildlife resources; occasionally detrimental impacts may occur (refer to Cultural Resources/Native American Values analysis elsewhere in this appendix).

10) Continue Present Management Arrangement. Continuing protective management of areas currently managed to conserve cultural and natural resource values would benefit wildlife resources.

11) Establish Cooperative Agreement. Management actions in cooperative agreements could range from increased surveillance to joint management with direct participation by more than one agency. If properly implemented, agreements should result in increased protection of wildlife resources. Coordination with owners of lands adjacent to or within an ACEC would be beneficial to wildlife.

12) Implement Comprehensive Habitat Management Plan (HMP). Preparation and implementation of HMPs, where coordinated and intensive wildlife management programs are required, would be beneficial to wildlife resources.

13) Acquire Private Holdings or Prepare Memorandum of Understanding Private Property Owner. Acquiring private lands or obtaining a long-term agreement of private landowner would permit protective management of the entire resource, preventing or eliminating incompatible uses on adjacent areas.

14) Implement Interpretive Program. Public education of natural resource values would be beneficial to wildlife.

J. IMPACTS OF THE LAND TENURE ELEMENT ON WILDLIFE

Methods of Determining Impacts

Potential impacts generated by the Land Tenure Element were assessed using criteria based on the following assumptions:

1. All lands included for acquisition or disposal would be acquired or disposed over the life of the plan (20 years).

2. Acquisition of lands for Areas of Critical Environmental Concern (ACEC), Class C and Class L generally would have a positive impact on wildlife by placing contiguous blocks of land under the administration of one agency, the BLM.

3. Acquisition of Class M and Class I lands would have a negative impact on wildlife because habitat quality may be degraded due to intensive use.

4. Surveys would be conducted to ensure that the habitat of officially listed and sensitive species is not included in a proposed land disposal.

5. Disposal of "islands" of public land surrounded by private lands could have two consequences: 1) little impact because the areas have been affected already; or 2) negative impacts when large portions of an important habitat and/or of species ranges are involved.

6. There will not be a unified plan to acquire lands with high wildlife values.

7. Management of lands acquired by the Bureau of Land Management in Classes C and L will benefit wildlife.

The procedure for assessing these impacts involved two different mapping phases. Phase One included developing a land tenure overlay from the Official Land Tenure maps (1:250,000 scale). The Land Tenure Element maps were complex, with areas of prospective transfer lands as small as one half section. To ease the impact evaluation process, working maps were developed using the general outline of different land tenure classes. Accuracy of the working overlay maps for each alternative varied from relatively precise boundaries for Class I and ACEC acquisition to general boundaries for Classes C or L acquisition. The precision of the borders for areas of disposal were close to those for Class I and ACEC but were less precise. The second mapping phase involved overlaying land tenure working maps for each plan alternative on maps of wildlife resources to determine the areas of species range and unique and representative habitats proposed for disposal, ACEC acquisition and C and L acquisition. The amount of wildlife habitat within each land transfer category was used to estimate the degree of

impact. For example, if a relatively large or important portion of a species' habitat was classified for disposal, the impact rating was "highly negative." "Negative" or "no substantial impact" ratings were assigned where only a small portion of a specie's range was proposed for transfer. In most cases, lands to be acquired would have a positive or highly positive impact on the wildlife species, whereas land disposal generally would have a negative or highly negative impact on wildlife species.

Nature of Land Tenure Element Impacts

Impacts of this element on wildlife were based on the relative amounts of additions to or deletions from protection-oriented land class designations. However, land acquisition and disposal is not based necessarily on wildlife values.

Acquisition of lands for Class I designation would have negative impacts on the vast majority of wildlife species. This class may receive intensive use in the form of off-road vehicle or mining. Both of these activities may have severe negative impacts on wildlife; however mining tends to be more restricted in the area of impact and may be controlled to a limited extent by federal regulations to restore the site. Conversely, off-road vehicle open areas are difficult to control and generally impact much broader areas.

Land disposals may negativley impact wildlife through loss of important or large areas of habitat. However, if the disposal areas and adjacent lands have been heavily impacted previously, disposal may have little substantial impact on wildlife.

Acquisitions for most ACECs may generally benefit wildlife as most ACECs would be protected for wildlife values. Acquisitions for Classes C and L may also generally be positive for wildlife. These are the most protected areas under any alternative of the Desert Plan. Acquisition of lands also would permit a unified management program by one land holder, thereby benefiting wildlife.

A final consideration is the assumption that the Bureau of Land Management would provide management which is beneficial to wildlife.

K. TRANSPORTATION - IMPACTS ON WILDLIFE

Nature of Transportation Impacts

The advent of the automobile at the turn of the century and the increasing dependence on this form of transportation have resulted in a rapidly expanding highway and road system nationwide over the past several decades. The effects of road and railway construction and construction and use on wildlife populations can include loss of native vegetation through construction and subsequent competition with hardy exotics capable of living in disturbed habitat (Minton 1968), erosion and sedimentation (Vice, et al. 1969) and indirect loss due to residential and business developments which follow new highways (Berryman 1963). Roads fragement wildlife habitat, creating small, often unstable, "island" refuges. Oxley, Fenton and Carmody (1974) suggested that highways serve as barriers between populations of animals; a four lane highway may be as effective a barrier between populations of small mammals as a body of water twice as wide. Pollutants from road maintenance and use includes herbicides, pesticides, lead, copper, nickel, chromium and petroleum (Lagerwerf and Specht 1970). Noise levels along highways or railway lines may affect animal behavior such as feeding activity (Ward 1973) and auditory cues (Leedy 1975). Highway water diversion increases sedimentation (Vice et al. 1969), induces changes in the surrounding terrain, groundwater and surface water basins, and runoff and recharge rates (Pavizek 1971). Channel diversion may have a particularly severe impact in desert regions where water sources supply critical habitat for species of highly localized distribution, and support vegetation which provides food, nesting space and habitat for resident and migratory birds.

Direct or indirect highway mortality can have a significant impact on wildlife populations. Dickenson (1939) has noted that wildlife hazards are presented by cars travelling at speeds over forty miles per hour, and by headlight glare that results in temporary blinding, confusion, hesitation and possible mortality. Nicholson (unpublished paper) noted an increase in desert tortoise densities with an increase in distance from a paved highway. To a distance of 0.5 mile; the roadside population apparently succumbs to highway mortality or collection for "pets". Welsh (1971) stated that 20 percent of the bighorn sheep deaths he surveyed were the result of highway fatalities and 12 percent were from fence mortality. Dickenson (1939) found 75 kangaroo rats trapped in a one mile section of paved highway which had recently been oiled. Hodson (1962) stated that birds were killed when feeding on insects or carrion, dust-bathing, taking grit, low flying or striking telephone wires. Reptiles and amphibians are particularly susceptible to highway mortality; the residual heat retained within the blacktop pavement of many desert roads attracts and causes nocturnal reptiles and amphibians to remain on the road for prolonged periods of time, thus increasing chances of mortality from a passing car or truck.

Migration of toads to rock tanks, ponds or rain pools during the breeding season may cause thousands of fatalities within short distances on paved roads (Rado, personal observation).

Highways may selectively benefit certain wildlife populations. Paved highways act as aprons for catching rainwater and often support a lush growth of grasses and forbs which attract herbivores. The desert range extension of the pocket gopher (Thomomys bottae) has been attributed to habitat modification along paved highways. Highway and railroad bridges provide cover for birds and bats (Davis and Cockrum 1963) and extend species ranges across geographic boundaries such as rivers (Broadbrooks 1958).

L. AGRICULTURAL DEVELOPMENT - IMPACTS ON WILDLIFE

Nature of Agricultural Development Impacts

Agricultural development in the California Desert is dependent largely upon irrigation. Water diversion is the primary source of water supplying extensive areas of crop production in the Imperial, Coachella and Colorado River Valleys. Local groundwater sources supply irrigation water at a number of locations, such as Fish Lake Valley, Deep Springs Valley, Mesquite Valley, Koehn Lake, Harper Lake, Troy Lake and Lucerne Valley, and along the Mojave River.

The establishment of agricultural areas entails the transformation of a natural ecosystem into a largely artificial environment created and maintained by man. The native plant community and associated wildlife are unable to survive in an environment which is constantly being disturbed by planting, maintenance and harvesting operations (Hawkes 1978). Agricultural conversion causes dynamic changes in adjacent areas; these changes are dependent on the size of the conversion, "manicuring" of field edges and fence rows, and control of water supplies and run-off. Application of pesticides also can offset wildlife populations and habitat on surrounding lands.

The establishment of isolated small agricultural developments may increase diversity of habitat and create an "edge" effect (i.e., the tendency for increased variety and density at community junctions) (Odum 1959). In small developments, manmade habitats probably do not effect an area significantly larger than the agricultural development, and may favor greater species diversity and utilization.

Large-scale and scattered small agricultural developments, however, affect large areas, and favors species which are adapted for utilizing the disturbed or early successional habitats found along canals, edges, roadways, buildings, or right-of-ways, and highly mobile species that can periodically and selectively use agricultural communities (Beers 1979). Agricultural development in the Imperial, Coachella and Colorado Sun Valleys have involved vast conversions of native plant assemblages entirely to an agricultural setting, completely destroying the endemic biota over an entire region. The removal of native vegetation for agricultural use may jeopardize the existence of entire wildlife populations. In the California Desert, optimal habitat for such species as the flat-tailed horned lizard (Phrynosoma maclli), Coachella Valley fringe-toed lizard (Uma inornata), desert tortoise (Goplerus agassizi), and Mohave ground squirrel (Spermophilus mohavensis) has been destroyed by agriculture. Herpetofaunal studies reveal low densities and diversity in agricultural areas. Maintenance activities, such as plowing, burning and herbicide spraying contribute to the demise of wildlife. Species which are unable to cope with the extensive habitat modification accompanying agricultural development include mammals such as foxes, coyotes, badgers and deer. In their absence, exploitive small

rodents, especially non-native species, have increased in marginal ruderal habitat. Most native desert birds are eliminated by agricultural development. A few species appear to be adaptive to agricultural situations as a result of their mobility. Some granivores feed on waste grain but roost and nest in distant, more isolated areas. Agricultural areas also benefit non-native species such as starlings and house sparrows, and flocks of blackbirds and shorbirds during the winter.

M. URBANIZATION - IMPACTS ON WILDLIFE

Nature of Urbanization Impacts

Urbanization in the CDCA causes changes in faunal composition by altering the native habitat, making it undesirable for many species. Habitats can be completely altered in the more densely populated areas where structures occupy former habitat and native habitat surrounding the structures are planted with exotic species. Suburban areas alter habitats to a lesser extent than do urban areas but still exert an influence on the native habitat.

Wildlife are effected in a number of ways by urbanization. Generally, carnivorous species, such as large snakes, bobcats (*Felis rufus*) kit fox (*Vulpes macrotis*), Golden Eagle (*Aguilia chrysaetos*) and prairie falcon (*Falco mexicanus*) decline in such areas. Coyotes (*Canis latrans*) however appear to adapt to light to moderate urbanization. Other smaller desert species also decline in urbanized areas. Species whose populations are enhanced by urbanization include doves, starling (*Sturnus vulgaris*), house sparrow (*Passer domesticus*), house finch (*Carpodacus mexicanus*), house mouse (*Mus musculus*) and Norway rat (*Rattus norwegicus*). It must be noted that many of those species which increase are introduced species which apparently are better able to adapt to urban situations.

Urbanization has numerous effects on wildlife in the CDCA. Some impacts can be reduced when wildlife is taken into consideration in the planning process (Leedy et al. 1978) and others must be mitigated.

N. FIRE IN RELATIONSHIP TO WILDLIFE

Methods of Determining Impacts

The effects of fire and fire management techniques have not been formally determined for the CDCA.

Nature of Impacts

Due to the minimal precipitation and inherent dryness of most desert habitats, the majority of fire-related impacts on habitat and wildlife involve techniques of fire management and fire prevention. Impacts are generally minimal on the CDCA (see Table 1).

Practices of fire management include the following: (1) plowing the perimeter of the burned zone, (2) where needed, plowing back-up lines ahead of the burning front, (3) clearing vegetation by hand, as an alternative to plowing and (4) applying retardents (via airtankers or ground crew) in order to slow fire, or (5) applying water. Fire prevention techniques in the CDCA include: construction of fuel breaks, maintained by plowing and/or application of herbicides.

Habitat destruction occurs through plowing around the perimeter of a fire, preparing back-up lines and developing and maintaining fuel breaks. Aside from the obvious habitat destruction on the surface, these practices also injure and destroy the roots of crown-sprouting trees and shrubs, preventing immediate regrowth and prolonging recovery time. Fuel breaks, if used, have the greatest impact since they are 10-30 times wider than the other practices and are maintained permanently. Preparing cleared areas such as these also encourages the use of off-road vehicles which would retard habitat recovery due to soil compaction and damage to vegetation. The maintenance of fuel breaks often requires the use of herbicides. The aerial use of herbicides and fire retardents which contain chemical constituents toxic to the foliage of many plants is a common practice. Some of these impacts can be reduced through increased use of human labor, firefighting by hand lining rather than machine plowing, ground based use of retardants and maintenance of fuel breaks by hand cutting rather than herbicides and transversally cut fuel breaks to prevent erosion.

Table 1
Acres Burned and Disturbance Statistics
for CDCA Fires 1974-1978[1]

Year	Total acres burned	BLM acres burned	Total acres disturbed[2]	Linear miles disturbed[2]	Total no. of vegetation fires[3]	Total vegetation fires>50 acres
1974	23	3	1.2	0.9	9	0
1975	1,623	809	15.1	10.9	15	4
1976	1	1	0.2	0.2	39	0
1977	55	55	2.8	2.1	39	0
1978	595	465	13.8	10.0	40	5

Acknowledgement: The information presented in this section was obtained from material provided by Joseph De Vita, Ph.D.

O. IMPACTS OF WILDLIFE ELEMENT ON WILDLIFE

Methods of Determining Impacts

The impacts of the Wildlife Element on wildlife resources were determined using analysis of existing Bureau policies and guidelines, Wildlife Element proposals, and class guideline restrictions from the Desert Plan. Wildlife resources currently are generally in a state of decline. Under the No Action Alternative, declines would probably continue for populations and habitats of several state and federal listed species and the desert tortoise, as well as many significant wildlife species and proposed BLM sensitive species. Positive actions undertaken in this alternative would be generally insufficient to meet the intent of the Endangered Species Act or Bureau policies regarding listed species, sensitive species and unique or representative ecosystems.

Ratings on the Alternatives were given using the following assumptions:

1) The present situation was used as a baseline for analysis.

2) Active, positive management plans for wildlife resources are compatible with Class C and L guidelines, but incompatible under Class M and I guidelines.

3) Protective management areas (Habitat Management Plans, restrictive designation on roads, Wilderness Management Plans and ACECs) are designed to have a positive impact on wildlife resources.

4) While the Bureau intends to protect listed wildlife and sensitive species in accordance with environmental law and Bureau policies, there are not enough active programs of habitat management for protection of some officially listed as well as most sensitive, "proposed" sensitive and significant species.

5) Implementation of all wildlife management plans described in the Wildlife Element should take place from one to seven years after approval of the Desert Plan to be an effective deterent to serious further adverse impacts.

P. ANIMAL INTRODUCTION: Man Induced and Natural Invasions.

Nature of the Impact

Approximately 50 introduced species of wildlife are currently inhabitants of the CDCA. These species include at least 37 fish, 7 birds, 3 mammals, one reptile, and one amphibian. The list would be greatly expanded if insects were included.

Species have been introduced to California for a number of reasons and in different ways. Introductions may be accidental, such as the bullfrog (Rana catesbeiana) (Stover 1922) or for a particular purpose. Some species such as Chukars (Alectoris chukar) (Christensen 1970), have been introduced for sport fishing or hunting; others have been introduced to assist in control of "pest" species such as anopholine mosquito larvae which are prey items for mosquitofish (Gambusia affinis) (Moyle 1976). A number of other fish species have been introduced as bait fish or for the pet trade 9-Moyle 1976). Some introductions have taken place for other reasons. The Starling (Sturnus vulgaris) was introduced into the United States because of the apparent "lack" of native birds (Chapman 1925).

Introduction of exotic species generally results in negative impacts on native wildlife through either direct or indirect interaction. Direct interactions with native species include 1) competition for resources, 2) predation or parasitism, and/or 3) by hybridization. Indirect effects include alteration or destruction of habitat which supports native species.

There may be some positive effects of introductions on native species. Two benefits are the control of "pest" species and increased recreational opportunities through hunting and fishing.

Introduction of fish species to control "pest" organisms often have negative impacts on the native fish fauna. Mosquitofish, introduced to control mosquito populations (Krumholy 1948, Moyle 1976), are known to overgraze zooplankton populations, disrupting normal energy flow patterns (Hurlbert et al. 1972) and have been accused of eliminating native fish through competition and predation (Miller 1961, Myers 1965, Minckley and Deacon 1968). Fish species introduced to control growth of aquatic plants, Mossambique mouthbrooder (Tilapia mossambica) and Zill's cichled (T. zillii), apparently have impacted negativley native fish species (Baerends and Baerends-VanRoon 1950, Moyle 1976). Other exotic introductions have had negative impacts on native species through hybridization, competition and/or predation.

Introductions of exotic bird species probably impact native bird species to some degree. Chukars probably compete with native quail species for limited resources; chukars, mountain quail (Oreortyx pictus) and rabbits have been observed to use the same waterholes in

arid and semi-arid areas (Harper et al. 1958). House sparrows (Passer domesticus) have invaded much of the United States since their introduction. This species is very aggressive and dominant to house finches (Carpodacus mexicaniis) at feeding stations, often driving the finches away (Kalinoski 1975). House sparrows are also known to take over nests and destroy eggs and nestlings belonging to cliff swallows (Petrochelidon pyrrhonota) (Samuel 1969). Starlings (Sturnus vulgaris) compete with native species for nest sites (Miller 1967) and are known to cause economic losses by eating grain in feed lots and eating seedlings of agricultural crops (Dolbeer et al. 1978, Feane 1975). Brown-headed cowbird (Molothrus ater) range and population have been increasing in recent years; Bell's vireo (Vireo bellii) range has declined over the same interval. The decline in vireo range is believed to be the result of parasitism by brown-headed cowbirds (Grinnell and Miller 1944, McCaskie 1969).

A number of exotic mammals have been introduced to the CDCA. The impacts of feral burros (Equus assinus) on wildlife are treated elsewhere (Appendix 10-b-vi). The house mouse (Mus musculus) has invaded remote areas within the CDCA. This species has a good ability to avoid predation (Pearson 1964) and is known to compete with Apodemus sylvatious, Peromyscus polionotus, P. maniculatus, and Microtus californious (Berry and, Tricker 1969, Caldwell 1964, Caldwell and Gentry 1965, Delong 1966, King 1957). Two of these, P. maniculatus and M. californicus, are native to the CDCA and are likely to be negativley affected by house mice. Feral dogos (Canis familiaris) are also present in the CDCA and are known to prey upon livestock (Bogges et al. 1978, Denny 1974) and wildlife (Denny 1974, Scott and Causey 1973). Feral dogs may also compete with coyotes. Domestic dogs often kill desert tortoise (Gopherus agassizi) living within a two to five-mile radius of desert towns (K. Berry personal communication).

PART IV

LIST OF WILDLIFE SPECIES
Fish observed witihin the CDCA

	Common Name	Scientific Name
	Threadfin Shad	Dorosoma petenense
	Rainbow Troute	Salmo gairdneri
	Carp	Cyprinus carpio
	Goldfish	Carassius auratus
	Golden Shiner	Notemigonus crysoleneas
1,2	Tui (Mohave) Chub	Gila bicolor mohavensis
	Arroyo Chub	Gila orcutti
6,a	Speckled Dace	Rhinichythys osculus
	Red Shiner	Notropis lutrensis
	Fathead Minnow	Pimephales promelus
	Humpback Sucker	Xyrauchen texanus
	Channel Catfish	Ictalurus punctatus
	Yellow Bullhead	Ictalurus natalis
	Brown Bullhead	Ictalurus nebulosus
	Black Bullhead	Ictalurus melas
	Flathead Catfish	Pylodictis olivaris
	Trinidad Rivulus	Rivulus harti
6	Desert Pupfish	Cyprinodon macularis
6,b	Amargosa Pupfish	Cyprinodon nevadensis
	Saltcreek Pupfish	Cyprinodon salinus
	Cottonball Marsh Pupfish	Cyprinodon milleri
	Mosquitofish	Gambusia affinis
	Sailfin Molly	Poecilia latipinna
	Shortfin Molly	Pecilia mexicana
	Variable Platyfish	Xiphophorus variatus
	Striped Bass	Morone saxatilis
	White Bass	Morone chrysops
	Black Crappie	Pomoxis nigromaculatus
	White Crappie	Pomoxis annularis
	Warmouth	Lepomis gulosus
	Green Sunfish	Lepomis cyanellus
	Bluegill	Lepomis macrolophus
	Redear Sunfish	Lepomis microlophus
	Largemouth Bass	Micropterus salmoides
	Smallmouth Bass	Microptarus dolomieui
	Mozambique Mouthbrooder	Tilapia mossambica
	Zill's Cichlid	Tilapia zillii
	Striped Mullet	Mugil cephalus
	Spotted Sleeper	Eleotris picta
	Longjaw Mudsucker	Gillichthys mirabilis
	Bairdella	Bairdella icistia
	Orangemouth Corvina	Cynoscion xanthuslus
	Sargo	Anistremus davidsoni

1. Federally Endangered

2. State Endangered
3. Federally Threatened
4. State Rare
5. BLM Sensitive
6. Proposed BLM Sensitive
7. Significant
a. Neavada Speckled Dace — Rinichythys osculus nevadensis
b. Amargosa River Pupfish — Cyprinodon nevadensis amargosae

Birds Observed within the CDCA

	Common Name	Scientific Name
	Common Loon	Gavia immer
	Arctic Loon	Gavia arctica
	Horned Grebe	Podiceps auritus
	Eared Brebe	Podiceps nigricollis
7	Western Crebe	Aechmophorus occidentalis
	Pied-billed Crebe	Podilymbus podiceps
	Sooty Shearwater	Puffinus griseus
	New Zealand Shearwater	Puffinus bullerd
	Laysan Albatross	Diomedea immutabulis
	Leach's Storm-petrel	Oceanodroma melnia
	Least Storm-petrel	Halocyptena microsoma
	Red-billed Tropicbird	Phaethon aethersus
7	White Pelican	Pelecanus ervthrorhynchos
1,2	Brown Pelican	Pelecanus occidentalis
	Blue-footed Booby	Sula nebouxii
	Brown Booby	Sula leucogaster
	Double-crested Cormorant	Phalacrocorax auritus
	Magnificent Frigatebird	Fregata magnificens
	Great Blue Heron	Aredea herodias
	Green Heron	Butorides striatus
	Little Blue Heron	Florida caerulea
	Cattle Egret	Bubulcus ibia
	Great Egret	Casmerodius albus
	Reddish Egret	Dichromanassa refescens
	Snowy Egret	Egretta thula
	Louisiana Heron	Hydranassa tricolor
	Black-crowned Night Heron	Nvcticorax nvcticorax
	Least Bittern	Ixobrychus exilia
	American Bittern	Botaurus lentiginosus
7	Wood Stork	Myctaria americana
7	White-faced Ibis	Plegadis chihi
	White Ibis	Eudocimus albus
	Roseate Spoonbill	Aiaia aiaia
	Whistling Swan	Olor columpianus
1,2,a	Canada Goose	Branta candadensis
	Brant	Branta bernicia
	White-fronted goose	Anser albifons
	Snow Goose	Chen caerulescens
	Ross' Goose	Chen rossii
	Black-bellied Whistling Duck	Dendrocygna autumnalis
7	Fulvous Whistling Duck	Dendrocygna bicolor
	Mallard	Anas platyrhvnchos
	Gadwall	Anas strepera
	Northern Pintail	Anas acuta
	Green-winged Teal	Anas crecca
	Baikai Teal	Anas formosa
	Blue-winged Teal	Anas discors
	Cinnamon Teal	Anas cyanoptera
	European Wigeon	Anas penelope
	American Wigeon	Anas americana
	Northern Shoveler	Anas clypeata

	Wood Duck	Air sponsa
	Redhead	Aythya americana
	Ring-necked Duck	Aythya collaris
7	Canvasback	Aythya valisineria
	Greater Scaup	Aythya marila
	Lasser Scaup	Aythya affinis
	Commo- Coldeneye	Bucephala clangula
	Barrow's Goldeneye	Bucephala islandica
	Bufflehead	Bucephala albeola
	Oldsquaw	Clangula hymalis
	White-winged Scoter	Melanitta deglandi
	Surf Scoter	Melanitta perspicillata
	Black Scoter	Melanitta nigra
	Ruddy Duck	Oxyura iamaicensis
	Hooded Merganser	Lophodytes cucullatus
	Common Merganser	Mergus merganser
	Red-breated Merganser	Mergus serrator
	Turkey Vulture	Cathartes aura
	California Condor	Gymnogyps californianus
	White-tailed Kite	Elanus leucurs
	Mississippi Kite	Ictinia mississippiensis
	Goshawk	Accipiter gentilis
7	Sharp-shinned Hawk	Accipiter striatus
7	Cooper's Hawk	Accipiter cooperi
	Red-tailed Hawk	Buteo iamicensis
7	Red-sholdered Hawk	Buteo lineatus
	Broad-winged Hawk	Buteo platypterus
7	Swainson's Hawk	Buteo swainsoni
	Zone-tailed Hawk	Buteo albonotatus
	Rough-legged Hawk	Buteo lagopus
	Ferruginous Hawk	Buteo regalis
7	Harris' Hawk	Parabuteo unicinctus
6	Golden Eagle	Quila chrysaetos
1,2	Bald Eagle	Haliaeetus leucccephalus
7	Marsh Hawk	Circus cvaneus
6	Osprey	Pandion haliaetus
7	Prairie Falcon	Falco mexicanus
1,2	Peregrine Falcon	Falco peregrinus
7	Merlin	Falco colubarius
	American Kestrel	Falco sparverius
7	California Quail	Lophortvs californious
7	Gambel's Quail	Lophortvs gambelii
7	Mountain Quail	Orsortvx pictus
	Ring-necked Phasant	Phasianus colchious
7	Chukar	Alectoris chukar
7	Sandhill Crane	Grus candadensis
1,4,b	Clapper Rail	Rallus longirostris
	Virginia Rail	Rallus limicola
	Sora	Prozana carolina
4,c	Black Rail	Laterallus iamaicensis
	Common Gallinule	Gallinula chloropus
	American Coot	Fulica americana
	American Oystercatcher	Haematopus palliatus

	Semipalmated Plover	Charadrius semipalmatus
7	Snowy Plover	Charadrius alexandrinus
	Killdeer	Charadrius vociferus
	Mountain Plover	Charadrius montanus
	American Golden Plover	Pluvialis dominica
	Black-bellied Plo-er	Pluvialis aquatarola
	Black Turnstone	Arenaria melanocephala
	Ruddy Turnstone	Arenaria interpres
	Common Snipe	Capella gallinago
	Long-billed Curlew	Numenius americanus
	Whimbrel	Numenius phaeopus
	Upland Sandpiper	Bartrami longicauda
	Spotted Sandpiper	Actitus macularia
	Wandering Tattler	Heteroscelus incanus
	Willet	Catoptrophorus semipalmatus
	Solitary Sandpiper	Tringa solitaria
	Greater Yellowlegs	Tringa melanoleucus
	Lesser Yellowlegs	Tringa flayiceps
	Red Knot	Calidris canutus
	Pectoral Sandpipe	Calidris melanotos
	White-rumped Sandpiper	Calidris fuscicollis
	Baird's Sandpiper	Calidris bairdii
	Least Sandpipe	Calidris minutilla
	Rufous-necked Sandpiper	Calidris ruficollis
	Curlew Sandpiper	Calidris ferrugines
	Dunlin	Calidris alpina
	Semipalmated Sandpiper	Calidris pusillus
	Western Sandpiper	Calidris mauri
	Sanderling	Calidris alba
	Short-billed Dowitcher	Limnodromus griseus
	Long-billed Dowitcher	Limnodormus scolopaceus
	Stitlt Sandpiper	Micropalama himantopus
	Buff-breasted Sandpiper	Tryngites subruficollis
	Marbled Godwit	Limosa fedoa
	American Avocet	Recuryirostra americana
	Black-necked Stilt	Himantopus mexicanus
	Red Phalarope	Phalaropus fulicarius
	Wilson's Phalarope	Steganopus tricolor
	Northern Phalarope	Lobipes lobatus
	Pomarine Jaeger	Stercorarius pomarinus
	Parasitic Jaeger	Stercorarius parasitious
	Long-tailed Jaeger	Starcorarius longicaudus
	Glaucous Gull	Larus hyperboreus
	Glaucous-winged Gull	Larus glaucescens
	Western Gull	Larus occidentalis
	Herring Gull	Larus argentatus
	Thayer's Gull	Larus thayeri
	California Gull	Larus californicus
	Ring-billed Gull	Larus delawarenis
	Mew Gull	Larus canus
	Laughing Gull	Larus atriculla
	Franklin's Gull	Larus pipixcan
	Bonaparte's Gull	Larus philadelphia

	Little Gull	Larus minutus
	Heermann's Gull	Larus heermanni
	Black-legged Kittiwake	Rissa tridactyla
	Sabine's Gull	Xema sabini
7	Gull-billed Tern	Gelochelidon nilotica
	Forester's Tern	Sterna foresteri
7	Common Tern	Sterna foresteri
7	Common Tern	Sterna hirundo
	Arctic Tern	Sterna paradisaea
7	Least Tern	Sterna albifrons
	Caspian Tern	Sterna caspia
7	Black Tern	Chlidonias niger
7	Black Skimmer	Rynchops nigra
7	Band-tailed Pigeon	Columba faciata
	Rock Dove	Columba livia
7	White-winged Dove	Zenaida asiatica
7	Morning Dove	Zenaidą macroura
	Spotted Dove	Streptopelia chinensis
	Ground Dove	Columbina passerina
	Inca Dove	Scardafella inca
4,d	Yellow-billed Cuckoo	Coccyzus americanus
	Roadrunner	Geococcyx californianus
	Barn Owl	Tyto alba
	Screech Owl	Otus asio
	Flammulated Owl	Otus flammeolus
	Great Horned Owl	Bubo virginianus
	Pygmy Owl	Glaucidium gnoma
6	Elf Owl	Micrathene whitneyi
7	Burrowing Owl	Athene cunicularia
	Spotted Owl	Strix occidentalis
	Long-eared Owl	Asio otus
7	Short-eared Owl	Asio flammeus
	Saw-whet Owl	Aegolius acadicus
	Whip-poor-will	Caprimulgus vociferus
7	Common Nighthak	Chordeiles minor
	Lesser Nighthawk	Chordeiles acutipennis
	Black Swift	Cypseloides niger
	Chimney Swift	Chaetura pelagica
	Vaux's Swift	Chaetura vauxi
	White-throacted Swift	Aeronautes saxatalis
	Blac-chinned Hummingbird	Archilochus alexandri
	Costa's Hummingbird	Calypte cosae
	Anna's Hummingbird	Calypte anna
	Broad-tailed Humminbird	Selasphorus platycercus
	Rufous Humminbird	Selasphorus rufus
	Allen's Humminbird	Salasphorus sasin
	Calliope Hummingbird	Selasphorus calliope
	Broad-billed Hummingbird	Cynanthus latirostris
	Belted Kingfisher	Megaceryle alcyon
	Common Fliker	Colaptes auratus
	Gila Woodpecker	Melanerpes uropygialis
	Red-headed Woodpecker	Melanerpes erythrocephalus
	Acron Woodpecker	Melanerpes formiciyorus

	Lewis' Woodpecker	Melanerpes lewis
	Yellow-bellied Sapsucker	Sphyrapicus varius
	Williamson's Sapsucker	Sphyrapicus thryoideus
	Hairy Woodpecker	Picoides villosus
	Downy Woodpecker	Picoides pubescens
	Nuttall's Woodpecker	Picoides nuttalli
	Eastern Kingbird	Tyrannus tyrannus
	Tropical Kingbird	Tyrannus melancholicus
	Western Kingbird	Tyrannus verticalis
	Cassin's Kingbord	Tyrannus vociferans
	Scissor-tailed Flycatcher	Musciyora forficata
7	Wied's Crested Flycatcher	Myiarchus tyrannulus
	Ash-throated Flycatcher	Myiarchus cinerascens
	Olivaceous Flycatcher	Myiarchus tuberculifer
	Eastern Phoebe	Savornis phoebe
	Black Phoebe	Savornis nigricans
	Say's Phoebe	Savornis sava
	Willow Flycatcher	Empidonax traillii
	Least Flycatcher	Empidonax minimus
	Hammond's Flycatcher	Empidonax hammondii
	Dusky Flycatcher	Empidonax oberholseri
	Gray Flycatcher	Empidonax wrightii
	Western Flycatcher	Empidonax difficulis
	Coue's Flycatcher	Contopus pertinax
	Western Wood Pewee	Contopus sordidulus
	Olive-sided Flycatcher	Nuttallornis borealis
6	Vermilion Flycatcher	Pyrocephalus runinus
	Horned Lark	Eremophila alpestris
	Violet-green Swallow	Tachycinèta thalassina
	Tree Swallow	Iridoprocne bicolor
	Bank Swallow	Riparia riparia
	Rought-winged Swallow	Stelgidopteryx ruficollis
	Barn Swallow	Hirundo rustica
	Cliff Swallow	Petrochelidon pyrrhonota
7	Purple Martin	Progne subis
	Blue Jay	Cvanocitta cristata
	Steller's Jay	Cyanocitta stelleri
	Scrub Jay	Aphelocoma coerulescens
	Black-billed Magpie	Pica pica
	Common Raven	Corvus corax
	Common Crow	Corvus brachyrhynchos
	Piñon Jay	Gymorphinus cvanocephalus
	Clark's Nutcracker	Nucifraga columbiana
	Mountain Chickadee	Parus gameli
	Plain Titmouse	Parus inornatus
	Verden	Auriparus flaviceps
	Bushtit	Psaltriparus minimus
	White-breasted Nuthatch	Sitta carolinensis
	Red-breasted Nuthatch	Sitta canadensis
	Pygmy Nuthatch	Sitta pygmes
	Brown Creeper	Certhia familiaris
	Dipper	Cinclus mexicanus

	House Wren	Troglodytes aedon
	Winter Wren	Troglodytes troglodytes
	Bewick's Wren	Thryomanes bewickii
	Cactus Wren	Camphylorhynchus brunneicapillius
	Long-billed Marsh Wren	Cistothorus palustris
	Canon Wren	Catherpes mexicanus
	Rock Wren	Salpinctes obsoletus
	Mockingbird	Mimus polyglottos
	Gray Catbird	Dumetella carolinensis
	Brown Thraser	Toxostoma rufum
	Bendire's Thrasher	Toxostoma bendirei
	Curve-billed Thrasher	Toxostoma curyirostre
	California Thrasher	Toxostoma redivivum
	Le Conte's Thrasher	Toxostoma lecontei
	Crissal Thrasher	Toxostoma dorsale
	Sage Thrasher	Oreoscoptes montanus
	American Robin	Turdus migratorius
	Varied Thrus	Ixoreus naevius
	Hermit Thrus	Catharus guttatus
7	Swainson's Thrush	Catharus ustualtus
	Veery	Catharus fuscescens
	Western Bluebird	Sialia mexicana
	Mountain Bluebird	Sialia currucoides
	Townsend's Solitaire	Myadestes townsendi
	Blue-gray Gnatcatcher	Polioptila caerulea
	Black-tailed Gnatcatcher	Polioptila melanura
	Golden-crowned Kinglet	Regulus satrapa
	Ruby-crowned Kinglet	Regulus cadendula
	Water Pipit	Anthus spinoletta
	Boehemian Waxwing	Bombycilla garrulus
	Cedar Waxwing	Bombycilla cedrorum
	Phainopepla	Phainopepla nitens
	Northern Shrike	Lanius excubitor
	Loggerhead Shrike	Lanius ludovicianus
	Starling	Sturnus vulgaris
	Hutton's Vireo	Vireo huttoni
6,e	Bell's Vireo	Vireo bellii
7	Gray Vireo	Vireo vicinior
	Yellow-throated Vireo	Vireo flavifrons
	Solitary Vireo	Vireo solitarius
	Philadelphia Vireo	Vireo philadelphious
	Warbling Vireo	Vireo gilyus
	Black-and-white Warbler	Mniotilta varia
	Prothonotary Warbler	Protonotaria citrea
	Worm-eating Warbler	Helmitheros vermiyorus
	Golden-winged Warbler	Vermivora chrysoptera
	Blue-winged Warler	Vermivora pinus
	Tennessee Warbler	Vermivora peregrina
	Orange-crowned Warbler	Vermivora celata
	Nashville Warbler	Vermivora ruficapilla
7	Virginia's Warbler	Vermivora virginiae
	Lucy's Warbler	Vermivora luciae
	Northern Parula	Parula americana

7	Yellow Warbler	Dendroica petechia
	Magnolia Warbler	Dendroica magnolia
	Cape May Warbler	Dendroica tigrina
	Blac-throated Blue Warbler	Dendroica caerulescens
	Yellow-rumped Warbler	Dendroica coronata
	Black-throated Gray Warbler	Dendroica nigrescens
	Townsend's Warbler	Dendroica townsendi
	Black-throated Green Warbler	Dendroica virens
	Hermit Warbler	Dendroica occidentalis
	Cerulean Warbler	Dendroica cerulea
	Blackburnian Warbler	Dendroica fusca
	Yellow-throated Warbler	Dendroica dominica
	Grace's Warbler	Dendroica graciae
	Chestnut-sided Warbler	Dendroica pensylvanica
	Bay-brested Warbler	Dendroica castanea
	Blackpoll Warbler	Dendroica striata
	Palm Warbler	Dendroica palmarum
	Ovenbird	Seiurus aurocapillus
	Northern Waterthrush	Seiurus noveboracensis
	MacGillivray's Warbler	Oporornis tolmiei
	Common Yellowthroat	Geothlypes trichas
7	Yellow-breasted Chat	Icteria virens
	Red-faced Warbler	Cardellina rubrifrous
	Hooded Warbler	Wilsonia citrina
	Canada Warbler	Wilsonia candadensis
	American Redstart	Setophaga ruticilla
	Painted Redstart	Myioborus pictus
	House Sparrow	Passer domestious
	Western Meadowlark	Sturnella neglecta
	Yellow-headed Blackbird	Xanthocephalus xanthocephalus
	Red-winged Blackbird	Agelaius phoeniceus
	Tricolored Blackbird	Agelaius tricolor
	Orchard Oriole	Icterius spurius
	Hooded Oriole	Icterus cucullatus
	Streak-backed Oriole	Icterus pustulatus
	Scott's Oriole	Icterus parisorum
	Northern Oriole	Icterus galbula
	Rusty Blackbird	Euphagus carolinus
	Brewer's Blackbird	Euphagus cyanocephalus
	Treat-tailed Grackle	Quiscalus mexicanus
	Brown-headed Cowbird	Molothrus ater
	Bronzed Cowbird	Molothrus aeneus
	Western Tanager	Piranga ludoviciana
	Scarlet Tanager	Piranga olivacea
7	Hepatic Tanager	Piranga flava
6	Summer Tanager	Piranga rubra
	Cardinal	Cardinalis cardinalis
	Pyrrhuloxia	Cardinalis sinuatus
	Rose-breasted Grosbeak	Pheucticus ludovicianus
	Black-headed Grosbeak	Pheucticus melanocephalus
	Blue Grosbeak	Guiraca caerulea
	Indigo Bunting	Passerina cyanea

	Lazuli Bunting	Passerina amoena
	Varied Bunting	Passerina versicolor
	Painted Bunting	Passerina ciris
	Dickcissel	Spiza americana
	Evening Grosbeak	Hesperiphona vespertina
	Purple Finch	Carpodacus purpursus
	Cassin's Finch	Carpodacus cassinii
	House Finch	Carpodacus mexicanus
	Gray-crowned Rosy Finch	Leucosticte tephrocotis
	Black Rosy Finch	Leucosticte atrata
	Pine Siskin	Carduelis pinus
	American Goldfinch	Carduelis tristis
	Lesser Goldfinch	Carduelis psaltria
	Lawrence's Goldfinch	Carduelis lawrencei
	Red Crossbill	Loxia curvirostra
	Green-tailed Towhee	Pipilo chlorurus
	Rufous-sided Towhee	Pipilo erythrophthalmus
6,f	Brown Towhee	Pipilo fuscus
	Albert's Towhee	Pipilo aberti
	Lark Bunting	Calamospiza melanocorys
	Savannah Sparrow	Passerculus sandwichensis
7	Grasshopper Sparrow	Ammodramus savannarum
	Le Conte's Sparrow	Ammospiza leconteii
	Sharp-tailed Sparrow	Ammospiza caudacuta
7	Vesper Sparrow	Pooecetes gramineus
	Lark Sparrow	Chondestes grammacus
	Rufous-crowned Sparrow	Aimophila ruficeps
	Cassin's Sparrow	Aimophila cassinii
	Black-throated Sparrow	Amphispiza bilineata
	Sage Sparrow	Amphispiza belli
	Dark-eyed Junco	Junco hyemalis
7	Gray-headed Junco	Junco caniceps
	Tree Sparrow	Spizella arborea
	Chipping Sparrow	Spizella passerina
	Clay-colored Sparrow	Spizella pallida
	Brewer's Sparrow	Spizella breweri
	Black-chinned Sparrow	Spizella atrogularis
	Harris' Sparrow	Zonotrichia querula
	White-crowned Sparrow	Zonotrichia leucophrys
	Golden-crowned Sparrow	Zonotrichia atricapilla
	White-throated Sparrow	Zonatrichia albicollis
	Fox Sparrow	Passerella iliaca
	Lincoln's Sparrow	Melospiza lincolnii
	Swamp Sparrow	Melospiza georgiana
	Song Sparrow	Melospiza melodia
	McCown's Longspur	Calcarius mocownii
	Lapland Longspur	Calcarius lapponicus
	Chestnut-collared Longsper	Calcarius ornatus
	Snow Bunting	Plectrophenax nivalis

1. Federally Endangered
2. State Endangered
3. Federally Threatened
4. State Rare
5. BLM Sensitive
6. Proposed BLM Sensitive
7. Significant

a.	Aleutian Canada Goose	Branta canadensis leucoparsia
b.	Yuma Clapper Rail	Rallus longirostris yumanensis
c.	California Black Rail	Laterallus iamaicensis coturniculus
d.	California Yellow-billed Cuckoo	Coccyzus americanus occidentalis
e.	Least Bell's Vireo	Vireo bellii pusillus
f.	Inyo Brown Towhee	Pipilo fuscus eremophilus

Amphibians Known to be Found within
or in Close Proximity to the CDCA

	Common Name	Scientific Name
1,2	Desert Slender Salamander	Batrachoseps aridis
	Garden Slender Salamander	Batrachoseps major
4	Tehachapi Slender Salamander	Batrachoseps stebbinsi
6	Inyo Mountains Salamander	Batrachoseps campi
	Counch's Spadefoot	Scaphiopus couchi
	Coloardo River Toad	Bufo alyarius
7,a	Western Toad	Bufo boreas
4	Black Toad	Bufo exsul
	Woodhouse's Toad	Bufo woodhousei
	Southwestern Toad	Bufo microscaphus
	Red-spotted Toad	Bufo punctatus
	Great Plains Toad	Bufo cognatus
	California Treefrog	Hyla cadaverina
7	Pacific Treefrog	Hyla regilla
6	San Sebastian Leopard Frog	Rana of pipiens
	Bullfrog	Rana catesbeiana

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1. Federally Endangered
2. State Endangered
3. Federally Threatened
4. State Rare
5. BLM Sensitive
6. Proposed BLM Sensitive
7. Significant

a. Amargosa Toad — Bufo boreas nelsoni

Reptiles Known to Occur in the CDCA

	Common Name	Scientific Name
6	Western Pond Turtle	Clemmys marmorata
5	Desert Tortoise	Gopherus agassizi
	Spiny Softshell	Trionyx spiniferus
	Banded Gecko	Coleonyx variegatus
6	Magic Gecko	Anarbylus switaki
7	Leaf-toed Gecko	Phyllodactylus xanti
	Desert Iguana	Dipsosaurus dorsalis
	Chuckwalla	Sauromalus obesus
	Zebra-tailed Lizard	Callisaurus draconoides
7	Colorado Desert Fringe-toed Lizard	Uma notata
6	Coachella Valley Fringe-toed Lizard	Uma inornata
7	Mojave Fringe-toed Lizard	Uma scoparia
	Lower Colorado Desert Collared Lizard	Crotaphytus insularis
	Desert Collared Lizard	Crotaphytus bicinctores
	Leopard Lizard	Gambelia wislizenii
	Desert Spiny Lizard	Sceloporus magister
	Granite Spiny Lizard	Sceloporus orcutti
	Western Fence Lizard	Sceloporus occidentalis
	Sagebrush Lizard	Sceloporus graciosus
	Side-blotched Lizard	Uta stansburiana
	Long-tailed Brush Lizard	Urosaurus graciosus
	Tree Lizard	Urosaurus ornatus
	Small-scaled Lizard	Urosaurus microscutatus
7	Banded Rock Lizard	Petrosaurus mearnsi
	Coast Horned Lizard	Phrynosoma coronatum
	Desert Horned Lizard	Phrynosoma platyrhinos
6	Flat-tailed Horned Lizard	Phrynosoma mcalli
	Granite Night Lizard	Xantusia henshawi
	Desert Night Lizard	Xantusia vigilis
	Western Skink	Eumeces skiltonianus
7	Gilbert's Skink	Eumeces gilberti
7	Orange-throated Whiptail	Cnemidophorus hyperythrus
	Western Whiptail	Cnemidophorus tigris
	Southern Alligator Lizard	Gerrhonotus multicarinatus
7	Panamint Alligator Lizard	Gerrhonotus panamintinus
	California Legless Lizard	Anniella pulchra
7	Gila Monster	Heloderma suspectum
	Western Blind Snake	Leptotyphlops humilis
7	Rosy Boa	Lichanura triyirgata
7	Ringneck Snake	Diadophis punctatus
	Spotted Leaf-nosed Snake	Phyllorhynchus decurtatus
	Racer	Coluber constrictor
	Coachwhip	Masticophis flagellum
	Striped Racer	Masticophis lateralis
	Striped Whipsnake	Masticophis taeniatus
	Western Patch-nosed Snake	Salvadora hexalepis
	Glossy Snake	Arizona elegans

	Gopher Snake	Pituophis melanoleucus
	Common Kingsnake	Lampropeltis getulus
	California Mountain Kingsnake	Lampropeltis zonata
	Long-nosed Snake	Rhinocheilus lecontei
	Western Terrestrial Garter Snake	Thamnophis elegans
	Checkered Garter Snake	Thamnophis marcianus
	Western Ground Snake	Sonora semiannulata
	Western Shovel-nosed Snake	Chionactis occipitalis
7	Western Black-headed Snake	Tantilla planiceps
	Lyre Snake	Trimorphodon biscutatus
	Night Snake	Hypsiglena torquata
	Western Diamondback Rattlesnake	Crotalus atrox
	Red Diamond Rattlesnake	Crotalus ruber
	Speckled Rattlesnake	Crotalus mitchelli
	Sidewinder	Crotalus cerastes
	Western Rattlesnake	Crotalus viridis
	Mojave Rattlesnake	Crotalus scutulatus

1. Federally Endangered
2. State Endangered
3. Federally Threatened
4. State Rare
5. BLM Sensitive
6. Proposed BLM Sensitive
7. Significant

Mammals Known to be Existing Within or in Close Proximity to the CDCA

	Common Name	Scientific Name
	Opossum	Didelphis virginiana
	Ornate Shrew	Sorex ornatus
7	Inyo Shrew	Sorex tenellus
	Merriam's Shrew	Sorex merriam
7	Desert Shrew	Notiosorex crawfordi
	Broad-footed Mole	Scapanus latimanus
7	California Leaf-nosed Bat	Macrotus californicus
	Little Brown Myotis	Myotis lucifugus
7	Yuma Myotis	Myotis yumanensis
7	Cave Myotis	Myotis yelifer
	Arizona Myotis	Myotis occultus
7	Long-eared Myotis	Myotis evotis
7	Fringed Myotis	Myotis thysanodes
7	Long-legged Myotis	Myotis volans
7	California Myotis	Myotis californicus
7	Small-footed Myotis	Myotis leibii
7	Silver-haired Bat	Lasionycteris noctivagens
7	Western Pipistrelle	Pipistrellus hesperus
7	Big Brown Bat	Eptesicus fuscus
	Red Bat	Lasiurus borealis
7	Hoary Bat	Lasiurus cinereus
7	Southern Yellow Bat	Lasiurus ega
7	Spotted Bat	Euderma maculatum
7	Townsend's Big-eared Bat	Plecotus townsendii
7	Pallid Bat	Antrozous pallidus
7	Barzilian Free-tailed Bat	Tadarida brasiliensis
7	Pocketed Free-tailed Bat	Tadarida femorosacca
	Big Free-tailed Bat	Tadarida molossa
7	Western Mastiff Bat	Eumops perotis
	Brush Rab-it	Sylyilagus bachmani
	Nuttall's Cottontail	Sylyilagus nuttallii
7	Desert Cottontail	Sylyilagus audubonii
7	Black-tailed Jack Rabbit	Lepus californicus
	Merriam's Chipmunk	Eutamias merriami
6,b;7,a	Panamint Chipmunk	Eutamias panamintinus
	Uinta Chipmunk	Eutamias umbrinus
	White-tailed Antelope Squirrel	Ammospermophilus leucurus
7	Rock Squirrel	Spermophilus variegatus
	California Ground Squirrel	Spermophilus beechevi
4	Mohave Ground Squirrel	Spermophilus mohavensis
6,c	Round-tailed Ground Squirrel	Spermophilus tereticaudus
	Golden-mantled Ground Squirrel	Spermophilus lateralis
	Western Gray Squirrel	Sciurus griseus
	Botta's Pocket Gopher	Thomomys bottae
7	Little Pocket Mouse	Perognathus longimembris
7	San Joaquin Pocket Mouse	Perognathus inornatus

	Great Basin Pocket Mouse	Perognathus paryus
6	Yellow-eared Pocket Mouse	Perognathus xanthonotus
	Long-tailed Pocket Mouse	Perognathus formosus
	Bailey's Pocket Mouse	Perognathus baileyi
	Desert Pocket Mouse	Perognathus penicillatus
	San Diego Pocket Mouse	Perognathus fallax
	California Pocket Mouse	Perognathus californicus
	Spiny Pocket Mouse	Perognathus spinatus
7	Pale Kangaroo Mouse	Microdipodops pallidus
7	Ord's Kangaroo Rat	Dipodomys ordii
7	Chisel-toothed Kangaroo Rat	Dipodomys microps
6	Panamint Kangaroo Rat	Dipodomys panamintinus
	Agile Kangaroo Rat	Dipodomys agilis
	Desert Kangaroo Rat	Dipodomys deserti
	Merriam's Kangaroo Rate	Dipodomys merriami
	Western Harvest Mouse	Reithrodontomys megalotis
	Canyon Mouse	Peromyscus crinitus
	California Mouse	Peromyscus californicus
	Cactus Mouse	Peromyscus eremicus
	Deer Mouse	Peromyscus maniculatus
	Brush Mouse	Peromyscus boylii
	Piñon Mouse	Peromyscus truei
	Northern Grasshopper Mouse	Onychomys leucogaster
	Southern Grasshopper Mouse	Onychomys torridus
	Hispid Cotton Rat	Sigmodon hispidus
	White-throated Woodrat	Neotoma albigula
	Desert Woodrat	Neotoma lepida
	Dusky-footed Woodrat	Neotoma fuscipes
	Bushy-tailed Woodrat	Neotoma cinerea
6,d;7,e	California Vole	Microtus californicus
	Sagebrush vole	Lagurus curtatus
7	Muskrat	Ondatra zibethicus
	House Mouse	Mus musculus
	Porcupine	Erethizon dorsatum
7	Coyote	Canis latrans
7	Kit Fox	Vulpes macrotis
7	Gray Fox	Urocyon cinereoargenteus
	Black Bear	Ursus americanus
7	Ringtail	Bassariscus astutus
7	Raccoon	Procyon lotor
	Long-tailed Weasel	Mustela frenata
7	Badger	Taxidea taxus
	Western Spotted Skunk	Spilogale gracilis
	Striped Skunk	Mephitis mephitis
7	Mountain Lion	Felis concolor
7	Bobcat	Felis rufus
7	Mule Deer	Odocoileus hemionus
4,f;6,g	Bighorn Sheep	Ovis canadensis

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1. Federally Endangered
2. State Endangered

3. Federally Threatened
4. State Rate
5. BLM Sensitive
6. Proposed BLM sensitive
7. Significant

a.	Panamint Chipmunk	Eutamis panamintinus panamintinus
b.	Kingston Mountains Chipmunk	Eutamias panamintinus acrus
c.	Coachella Round-tailed Ground Squirrel	Spermophilus tereticaudus chlorus
d.	Amargosa Vole	Microtus californicus scirpensis
e.	Mojave Vole	Microtus californicus mohavensis
f.	Peninsular Bighorn Sheep	Ovis candadensis cremnobates
f.	California Bighorn Sheep	Ovis candadensis californiae
g.	Desert Bighorn Sheep	Ovis candadensis nelsoni

Sensitive/Significant Species of the CDCA

Proposed BLM Sensitive Invertebrates

Trithyreus shoshonensis - Shoshone Cave Ship-Scorpion
Pseudocotalpa andrewsi - Andrews' Dune Scarab Beetle

Invertebrates - Molluses (Family - Helminthoglyptidae)

Helminthoglypta graniticola
Helminthoglypta greggi
Helminthoglypta micrometalleoides
Helminthoglypta mohaveana
Micrarionta aquaelbae
Micrarionta brunnea
Micrarionta harperi
Micrarionta immaculata
Micrarionta indioensis cathedralis
Micrarionta melanopylon
Micrarionta millepalmarum
Micrarionta morongoana
Micrarionta orocopia
Micrarionta rowelli
- *Micrarionta rowelli acus*
- *Micrarionta rowelli amboiana*
- *Micrarionta rowelli bakerensis*
- *Micrarionta rowelli chocolata*
- *Micrarionta rowelli chuckwallana*
- *Micrarionta rowelli granitensis*
- *Micrarionta rowelli mocoiana*

Mohavelix micrometalleus
Sonorelix ayawatzica
Sonorelix baileyi
Sonorelix borregoensis
- *Sonorelix borregoensis borregoensis*
- *Sonorelix borregoensis carrizoensis*
- *Sonorelix borregoensis ora*

Sonorelix rixfordi
Fontelicella micrococcus
Fontelicella n. sp.

Invertebrates - Cladocera (Family: Moinidae)

Moina brachycephela

Invertebrates - Insects (order - Lepidoptera) Butterflies/Moths

Ethmiidae (Ethmiid Moths):
- *Ethmia* n. sp.

Tortricidae (Tortricid Moths):
<u>Suleima</u> n. sp.
Scythridae (Scythrid Moths):
<u>Areniscythris</u> n.sp.
N.gen., n.sp.
Lapidoptera (cont.)

Noctuidae (Noctuid Moths):
<u>Protogygia polingi</u>
<u>Copablepharon serrata</u>
Pyralidae (Pyralid Moths):
<u>Loxocrambus mohaviellus</u>
Andrenidae (Andrenid Bees):
<u>Andrena boronensis</u>
<u>Andrena deserticola</u>
<u>Andrena mojavensis</u>
<u>Nomadopsis folevi</u>
<u>Nomadopsis larreae</u>
<u>Nomadopsis timberlakei</u>
Megachilida (Leaf-cutting Bees):
<u>Anthocopa panamintensis</u>
<u>Ashmeadiella stenognatha</u>
<u>Dianthidium desertorum</u>
<u>Heteranthidium bequaerti</u>
<u>Proteriades bidenticauda</u>
<u>Proteriades hamulicornis</u>
Colletidae (Masterer Bees):
<u>Colletes stepheni</u>
Masaridae:
<u>Pseudomasaris micheneri</u>
Sphecidae (Sphecid Wasps):
<u>Bembix</u> n.sp.
Vespidae (Vespid Wasps):
<u>Polistes major palmarum</u>
Formicidae (ants):
<u>Hypoponera opaciceps</u>
<u>Hypoponera opacior</u>
<u>Pogonomyrmex anzensis</u>
<u>Pogonomyrmex desertorum</u>
<u>Pogonomyrmex tenuispinus</u>
<u>Pheidole psammophila</u>
<u>Acromyrmex versicolor</u>
<u>Myrmecocystus</u> n.sp.
<u>Solenopsis</u> n.sp.
<u>Leptothorax</u> sp. A

Invertebrates - Insects (order - Hemiptera) True Bugs

Corixidae (Water Boatmen):
<u>Trichocorixa verticalis saltoni</u>

Invertebrates - Insects (order-Diptera) Flies

Asilidae (Robber Flies):

Efferia?

Efferia tolandi

Efferia vermo

Asilidae (Cont.)

Proctacanthella tolandi

Promachus?

Machimus species nr. callidus

Cophura dammersi

Cophura getzendaneri

Cophura powersi

Cophura rozeni

Cophura timberlakei

Cophura tolandi

Cophura vandykei

Diogmites contortus

Lestomyia Sp. 2 - (New)

Omniablautus nigripes

Omniablautus tolandi

Omniablautus n. sp.

Cerotainiops moclavi

Laphystia howlandi

Laphystia martini

Ablautus basini

Ablautus coachellus

Ablautus linslevi

Backomyia anomalus

Backomyia n.sp.

Eucyrtopogon n.sp.

Itolia timberlakei

Metapogon amargosae

Metapogon tricellus

Nannocyrtopogon deserti

Nannocyrtopogon inyoi

Nannocyrtopogon neoculatus

Nannocyrtopogon oculatus

Nannocyrtopogon timberlakei

Nannocyrtopogon tolandi

Nannocyrtopogon n.sp.

Ospriocerus brevis

Sintoria mojavae

Stenopogon adelantae

Stenopogon mojavae

Invertebrates - Insects (order - Coleoptera) Beetles

Histeridae (Hister Beetles):

Philothris sp.

Scydmaenidae (Antlike stone Beetles):

Eremosaprinus n.sp.

Papusus sp.

Dytiscidae (Predaceous Diving Beetles):

Deronectes coelamboides

Hydrophilidae (Water Scavenger Beetles):

Berosus of *ingeminatus*

Curculionidae (Weevils):

Trigonoscuta rothi

Trigonoscuta n.sp.

Trigonoscuta brunotesselatus

Trigonoscuta kelsoensis kelsoensis

Trigonoscuta sp.

Miloderes nelsoni

Miloderes n.sp.#1

Miloderes n.sp.#2

Minyomerus n.sp.

Eucilinus aridus tinkhami

Dermestidae (Dermestids):

Novelsis sp.

Pedilidae (Pedilid Bettles):

N. gen., n.sp.

Tenebrionidae (Darkling Beetles):

Areoschizus sp.

Eusattus fortineri

Batuliodes n.sp.

Chrysomelidae (leaf Bettles):

N. gen., n.sp.

Cryptophagidae (Silken Fungus Beetles):

Cryptophagus n.sp.

Elateridae (Click Beetles):

Cardiophorus n.sp.

Horistonotus n.sp.

Scarabaeidae (Scarab Beetles):

Anomala carlsoni

Anomala hardyorum

Cyclocephala wandae

Diplotaxis corbula

Glaresis arenata

Curculionidae (Weevils):
- Trigonoscuta rothi
- Trigonoscuta n.sp.
- Trigonoscuta brunotesselatus
- Trigonoscuta kelsoensis kelsoensis
- Trigonoscuta sp.
- Miloderes nelsoni
- Miloderes n.sp.#1
- Miloderes n.sp.#2
- Minyomerus n.sp.
- Eucilinus aridus tinkhami
- Dermestidae (Dermestids):
- Novelsis sp.

Pedilidae (Pedilid Beetles):
- N. gen., n.sp.

Tenebrionidae (Darkling Beetles):
- Areoschizus sp.
- Eusattus fortineri
- Batuliodes n.sp.

Chrysomelidae (Leaf Beetles):
- N. gen., n.sp.

Cryptophagidae (Silken Fungus Beetles):
- Cryptophagus n.sp.

Elateridae (Click Beetles):
- Cardiophorus n.sp.
- Horistonotus n.sp.

Scarabaeidae (Scarab Beetles):
- Anomala carlsoni
- Anomala hardyorum
- Cyclocephala wandae
- Diplotaxis corbula
- Glaresis arenata

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